

The *Journal of the* *Academy of Music* *Fund*
QUARTERLY

APRIL

**TWENTY
CENTS**

**XXXI
NO.**



The Milbank Memorial Fund
QUARTERLY

CONTENTS

	Page
IN THIS ISSUE	119
RESEARCH TECHNIQUES IN THE STUDY OF HUMAN BEINGS <i>William G. Cochran</i>	121
NUTRITIONAL STATUS OF INDUSTRIAL WORKERS. II. EFFECTS OF EDUCATION, AGE, INCOME, AND ETHNIC GROUPS <i>M. J. Babcock, Helen N. Church, and Lorraine O. Gates</i>	137
THE RELIGIO-CULTURAL BACKGROUND OF NEW YORK CITY'S POPULATION <i>Neva R. Deardorff</i>	152
DIFFERENTIAL FERTILITY IN MADISON COUNTY, NEW YORK, 1865 <i>Wendell H. Bash</i>	161
"IDEALS" ABOUT FAMILY SIZE IN THE DETROIT METROPOLI- TAN AREA: 1954 <i>Ronald Freedman, David Goldberg, and Harry Sharp</i>	187
ANNOTATIONS	
Impairment Study—1951 <i>Richard V. Karius</i>	198
Accident Frequency, Place of Occurrence, and Relation to Chronic Disease <i>Marguerite Keller</i>	199
World Population and Production <i>Clyde V. Kiser</i>	203
A Theory of Economic-Demographic Development <i>John D. Durand</i>	206

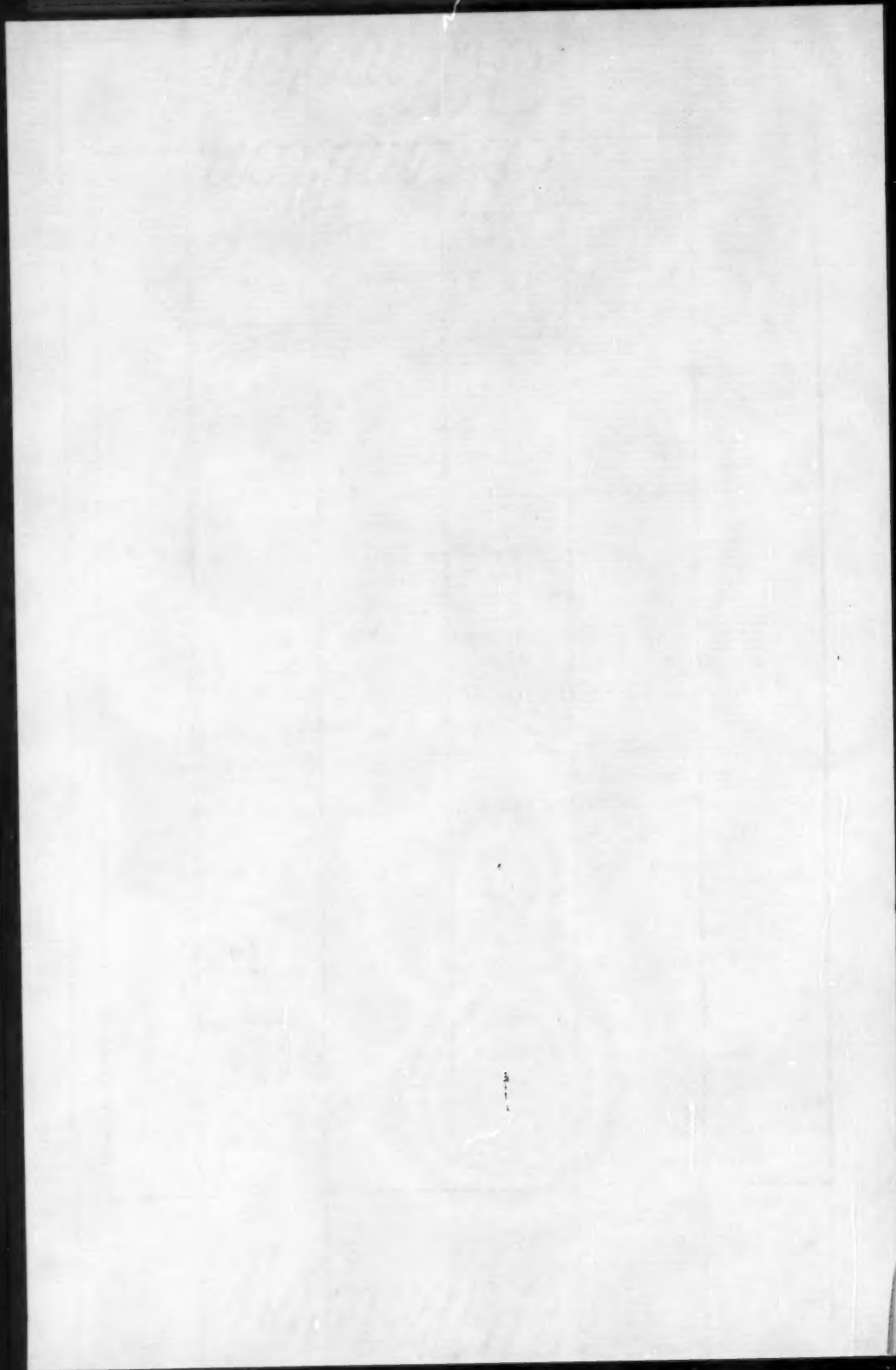
Vol. XXXIII

APRIL 1955

No. 2

Edited by the Technical Staff

Published quarterly by the MILBANK MEMORIAL FUND, 40 Wall Street,
New York 5, New York. Printed in the U. S. A. Subscription: \$1.00 a year.



IN THIS ISSUE

AT THE Fund's Annual Dinner Meeting on November 18th, 1954, Professor William G. Cochran spoke to the group on "Research Techniques in the Study of Human Beings." His paper is published in the following pages at the request of many who heard it. This summary of the basic approaches and problems in human research is interspersed with provocative comment and suggestions. While pointing out difficulties and pitfalls, Professor Cochran remains an optimist.

• • •

Programs designed to improve the nutritional status of industrial workers can benefit from knowledge of factors which are related to dietary habits and nutritional status. For a group of 600 male industrial workers for whom dietary, blood, and physical findings were available, M. J. Babcock, Helen N. Church, and Lorraine O. Gates present data on the importance of several factors in the article entitled "Nutritional Status of Industrial Workers. II. Effects of education, age, income, and ethnic group." Although each of these factors has some effect on nutritional status, the authors find that "the dominant trend was for evidence of suboptimal nutrition, and also obesity, to be widely distributed throughout all education, age, income and ethnic groups."

• • •

Since the characteristics of the population recorded in official enumerations do not include religious affiliation, data on the distribution of the population within a geographic area by broad religious grouping rarely are available. A recent survey by the Health Insurance Plan of Greater New York has furnished

such data for a sample population of the City. In "The Religio-Cultural Background of New York City's Population," Neva R. Deardorff presents the figures from the 1952 survey and compares them with similar data on religious affiliation reported by the Youth Survey conducted in New York in 1935. The size of the various religio-cultural groups in the community often is a significant factor pertinent to the planning of community programs by social agencies.

• • •

In the New York State Census of 1865 each ever-married adult female was asked the total number of children she had ever borne. The published census volume provided distributions of the native and foreign born women by number of children ever born. However, it remained for Dr. Wendell Bash to take advantage of the possibilities of studying the status of differential fertility by occupation and other criteria of socioeconomic status within at least one county of New York State. He presents his results in the article "Differential Fertility in Madison County, New York, 1865." His study is important because it suggests that even at the close of the Civil War occupational differentials in fertility were well entrenched in one area of New York State.

• • •

In 1954 the following question was included in the annual sample survey of the Detroit Area Study: "In your opinion, what would be the ideal number of children for a young couple to have, if their standard of living is about like yours?" The replies to this question are analyzed in relation to earlier data and in relation to various social characteristics of the respondents in the article "'Ideals' About Family Size in the Detroit Metropolitan Area: 1954," by Ronald Freedman, David Goldberg, and Harry Sharp of the Survey Research Center of the Institute for Social Research of the University of Michigan. "In a country in which most married people make some use of family limitation practices," the authors point out, "the values held about 'ideal family size' are likely to be important in influencing family growth and population trends."

RESEARCH TECHNIQUES IN THE STUDY OF HUMAN BEINGS

WILLIAM G. COCHRAN¹

WHEN Dr. Boudreau invited me to speak tonight, he happened to mention some of the hopes expressed by Dr. Sydenstricker when the Milbank Memorial Fund's division of research was established in 1929. I was struck by one phrase which Dr. Sydenstricker used: he referred to "the possibility of including social data in the domain of scientific research." This phrase set me to trying to sort out my impressions of the quantitative study of human beings as a supposed branch of science. How well is it progressing relative to other branches of science?

Consequently, I would like to present a few of these impressions, with particular reference to the tools of measurement and the general methods of investigation that have been developed.

The claims of the study of social data to be regarded as a branch of science were examined in the 1830's. The occasion was an application made to the British Association for the Advancement of Science to form a section in statistics. In those days, statistical data dealt largely with economic or social matters. The Association appointed a committee to report on the application, and one of its tasks was to consider whether statistics *was* a branch of science. The committee's verdict is interesting. So long as statistics confined itself to the collection, tabulation, and orderly presentation of data, that was science. But if statistics were to concern itself with the interpretation of economic and social data, that would be argumentation, with passions and politics entering, and that was not science. In the picturesque language of the committee, the interpretation of such data could not be allowed as a branch of science, "lest we admit the foul demon of discord into the Eden of philosophy."

The same point of view was maintained a few years later

¹ Professor of Biostatistics, The Johns Hopkins University.

when a statistical society (which became the Royal Statistical Society) was formed in London. The Committee's verdict was in fact embodied in the motto of the new society. This motto consisted of a fat sheaf of wheat, representing the abundant harvest of data that has been collected and tidily arranged. Around the motto was an ornamental ribbon, like the ribbon worn by Miss Atlantic City in the Beauty contests. But in place of the words "Miss Atlantic City" was the Latin motto "*Aliis extarendum*"—"Let others thrash it out." I am slightly embarrassed that the statisticians should have started their organized career by timidly proclaiming to the world what they will *not* do. The motto is also curious in that the chairman at the early meetings in which statistical organization was discussed was a man well-known to some of you, by the name of Thomas Malthus. It is true that he left much material for others to thrash out, but he did a certain amount of "thrashing out" himself.

Since I shall speak from the viewpoint of the statistician—I can't help it—I must first say a little about statisticians and their relations to scientists. The statistician has long been known as a person who handles data, and the scientist tends to think of seeing a statistician when he has some problem in the analysis of his data. In earlier days, this happened mostly when something had gone wrong with the experiment or survey—or more accurately when the scientist realized that something had gone wrong. As a result, statisticians used to see a sorry collection of the wrecks of research projects.

Now it is a hard fact, which the statistician and the scientist both had to learn, that little could be done to get these wrecks floating again. Usually, some error in the way in which the data were collected made it impossible to draw sound conclusions, manipulate them how you will. This led to two developments. The statistician began to advise scientists to come and see him at the beginning of an investigation—to make him, as it were, an accessory before the fact. Also, the statisticians began to study the process of collecting data in order to learn

what procedures and precautions were necessary to ensure that sound conclusions *could* be drawn at the end.

The result is that, at present, the role played by the statistician in the planning of research is often that of verifying that the scientific methodology is sound and sometimes even that of supplying the scientific methodology. Of course, the statistician has other duties. He helps with the arithmetic, tells where the decimal point goes, and he may supply technical formulas from statistical theory, but these are often secondary contributions. Perhaps the statistician's role as a consultant in scientific methods is temporary, because one would expect scientists to perform this function themselves. Indeed, there are signs of a trend in this direction. A few years ago, a conference with a physician about the testing of new drugs on hospital patients seemed to be mainly a matter of trying to wheedle or cajole the physician into taking some precautions that he regarded as a nuisance and as unnecessary. Now he is often found insisting on these precautions himself before the statistician can open his mouth, and the statistician's contribution is to nod his head in agreement at diplomatic intervals. In time, the doctors may decide that they don't need this yes-man.

While it lasts, this role requires close and friendly cooperation between statisticians and research workers. In statistical training centers, something is done to teach young statisticians how to get along with scientists. While in the presence of a number of distinguished scientists, I would like to give a few hints on how to get along with statisticians. In any extensive discussion of a statistical problem, some wag is likely to repeat the old chestnut about the three kinds of lies: "lies, damn lies, and statistics." If you feel an urge to give birth to this witticism, please remember that it is not new, and it was not funny when it was new. The statistician also gets tired of hearing the scientist say "Of course, I am no statistician," in a tone of voice which implies that he is mentioning one of his most sterling virtues. If you *are* no statistician, this fact will prob-

ably reveal itself in the course of the conversation, and if you must tell us about it, please do so with an apologetic air. Remember also that the statistician is a poor marriage risk, and may be suffering from marital strains. The reason for this is that the statistician has to cultivate a dislike for imprecise statements, and the person most likely to be making imprecise statements in his vicinity is his unfortunate wife. Statisticians' wives have not, thank goodness, formed an international union, but if they do, the first plank in its platform will be to stop their husbands from being so persnickety.

TOOLS OF MEASUREMENT

The consulting statistician has a fascinating opportunity to learn something about the triumphs and the difficulties of research in different branches of science. He begins to wonder why some branches are forging ahead in an exciting way, while others seem to be creeping. Among the numerous factors that influence the rate of progress of scientific research, two of the most important are the tools of measurement that the research worker has at his disposal and the general methods of investigation available to him.

I shall use the phrase "tools of measurement" in a broad sense, to cover both the range of phenomena that can be measured and the precision of the measuring devices. It can be argued that the available tools of measurement are the most important single factor in determining the rate of progress in a field of research. I do not wish to build up this argument, but one example may be quoted from physics. Towards the end of the last century, the laws of physics seemed to have reached a pinnacle. They were of high accuracy, of immense scope, and were pleasing to common sense. Then improvements in measurement were made that enabled very minute bodies as well as very distant bodies to be more accurately studied. Large cracks appeared in the edifice of physical theory, and to the rescue the physicists had to bring in the revolutionary ideas of quantum mechanics and the theory of relativity. To judge from

their difficulties in understanding these concepts and in reconciling them with simple common sense ideas, they must have felt at times as if they had brought in the Marx brothers to repair the building.

The importance that is rightly attached to an improvement in measuring technique is illustrated by the recent award of the Nobel prize in medicine to Dr. Enders and his associates. Their contribution was to grow poliomyelitis virus in tissue culture, and other workers helped to perfect the technique. What does this mean to research in the field? In measuring virus concentrations in specimens from suspected polio cases, as many tests can now be made from the kidneys of a discarded monkey as required 600 monkeys previously. The monkey can be dispensed with entirely, by use of the Hela human cancer cells. Experiments that were impossible can now be done in a week. After a development of this type, any area of research can expect to take great strides forward.

A second impression about measurement techniques is that one never knows where the next advance is coming from. Often it does not come from the field of work that desperately needs the advance. The anthropologists, after measuring skulls from every angle with admirable zeal, have to thank the geneticists for blood group methods that for some purposes are much more reliable. The paleontologists were presented with a new and independent method of dating fossils—radioactive carbon—by the physicists. The electron microscope is a godsend to the manufacturers of paint. And so on.

In the study of human beings many of the problems of measurement are formidable. Not only have we to measure fairly concrete attributes like the state of disease in the individual, (which the doctors will assure us is not easy to measure well) but we need to classify and if possible to measure many things that are hard enough to define in the first place, like motives, morale, intentions, feelings of stress. This means a vast undertaking that has had to start from the ground with rude home-made tools. Thus far, for want of anything better in sight, we

have obtained our raw data mainly from what the individual tells us. And the recording instrument has usually been another individual.

We are having to learn about the idiosyncrasies of the human being as a reporter. On the whole, he is surprisingly cooperative, and his good nature in taking up his time to talk to us is heartwarming. He is, in fact, a little too friendly, and will sometimes give the kind of answers which he thinks we would like to have. He is anxious to put on a good front: his statement about the amount he paid for his present car is not entirely to be trusted, and his plans for buying all sorts of expensive gadgets in the future are still less so. On the other hand, he can shut up like a clam. At the end of the war, I helped to gather some data from a carefully selected sample of the German civilian population. According to our results, the Nazi party was one of the world's most exclusive clubs. He is loyal to those whom he likes. The English, in their industrial mortality statistics, were puzzled by the fact that the death rate for the drivers of railway engines (i.e. the locomotive engineers) was above the national average, while that for the man with the apparently less healthy job of stoking the coal furnace was well below. The explanation was that father, after a life of service as stoker, was often posthumously promoted by mother to the position of engine driver on the death certificate.

The recording device—the interviewer—is not perfect either. A quotation from Bertrand Russell, although rather overdrawn, illustrates this point. He is writing about studies of learning in animals. "The animals that have been carefully observed have all displayed the national characteristics of the observer. Animals studied by Americans rush about frantically, with an incredible display of hustle and pep, and at last achieve the desired result by chance. Animals observed by Germans sit still and think, and at last evolve the solution out of their inner consciousness. To the plain man, such as the present writer, this situation is discouraging."

As instances of the amount that has to be learned in order to

make the best use of human beings as reporters and recorders, the following are some, but by no means all, of the questions that arise in the planning of morbidity surveys in which the data are obtained by interviews in the home. Over what period of time can the subject remember episodes of illness? What types of illness are easily remembered and accurately reported, and what types are poorly reported? What aids to memory are worth while? How well does the housewife remember and report illnesses of other members of the family? To what extent can the reports be used for a diagnostic classification of the illnesses? How much is gained by checking the reports with physicians who have attended the families? How do lay interviewers compare in effectiveness with public health nurses or medical students? How much information can be picked up at a second visit that was missed at the first? Since a substantial amount of experience has been accumulated for morbidity surveys, at least partial answers can be given to these questions. In other words, something is now known about the precision and the limitations of this type of measuring tool, and about good and bad ways of applying it. Research on more difficult concepts like attitudes and sources of motivation will in time have to answer an analogous list of questions about the interviewer-respondent relationship.

Social scientists are attacking vigorously the fascinating problems involved in devising ways of classifying and measuring what might be called, for want of better words, the strengths and directions of opinions, attitudes, and feelings. They are making surprisingly early use of quantitative scales, with an implied continuum in the background, and have shown ingenuity in constructing methods for testing the internal consistency of the scale and for checking how well the scaled results can be reproduced from a second examination of the same group of people. The criticism has been made, with some justification, that these scales may deceive research workers into thinking that they have measured some rather intangible quantity that they are nowhere in sight of measuring. I don't think that the

difficulty arises from the use of quantitative scales themselves: the dangers in pushing this process too fast do not seem to me great. It would be well, however, to be cautious and humble in making claims about what we have measured. Until we are very sure of our ground, use of long Greek names for the things measured might be preferable, rather than claiming to have measured, say, the strength of maternal affection.

GENERAL METHODS OF INVESTIGATION

Methods of investigation in scientific research can be classified roughly into three types, which may be called chance observations, planned observations, and experiments.

Chance Observations. Something unusual strikes the curiosity of an alert scientist, and off he goes into a chain of speculation and then into action. Many of you have heard Sir Alexander Fleming's account of the beginnings of his discovery of penicillin. He happened to notice an unusual contamination from the air of some plates lying in his laboratory. The contribution of chance observations to progress in science must be very great. Last week I was talking to a productive scientist who had had occasion to review carefully his work during the past fifteen years. He remarked that, to his surprise, all his most important discoveries had arisen in unexpected deviations from his main path of research. None of them would have appeared in that anathema of the modern scientist—the "Statement of work to be done during the next fiscal year."

Planned Observations. Here the scientist knows what he is after—he knows the questions to which he would like answers—and he maps out a plan of observation which he hopes will provide the answers. Some of the current investigations of the relation between smoking and cancer of the lung are of this type. In the British Medical Research Council's study, all the British doctors were asked three years ago to fill out a questionnaire giving their ages and their recent smoking habits. The rest of the study is just a matter of waiting until a reasonable proportion have died, and then examining whether the death

rate and the causes of death are related to smoking habits. Doctors present many advantages for this kind of study: they are likely to cooperate, it is relatively easy to find out if they have died, and when they do die there is reason to believe that the cause of death will be more accurately known than for laymen.

Experiments. The word "experiment" has a very broad meaning both in common speech and among scientists. For my present purpose I would like to restrict it to situations in which we are able to *interfere* with nature. In this sense, the essence of an experiment is that we deliberately apply certain chosen procedures for the purpose of measuring their effects. The power of experimentation in speeding up progress in science is tremendous. It has two strong advantages over the observational method. It enables us to select for investigation the factor or factors that will be most informative, whereas with observations, we are restricted to those factors that nature is kind enough to give us the opportunity to observe. The experiment is also the surest method of working out the causal relations that underlie the associations which we observe. With the observational method, the step from correlation to causation is often hazardous and uncertain. For instance, even if several studies in different countries should reach the common conclusion that the death rate from cancer of the lung increases steadily as the amount of smoking increases, the objection will be made (in fact, it has already been made) that this is not a cause and effect relationship, because of the alternative possibility that the kinds of men who smoke heavily are unusually susceptible to cancer of the lung, and would be so even if they did not smoke. Whatever our opinions about the plausibility of this explanation, it is hard to devise an observational study that will clearly support or rebut it. If experimentation were possible, the issue could be cleared up much more easily.

In the study of human beings we are groping our way around among these general methodologies, trying to find which ones pay off best in results. Thus far, observational methods have

been used to a large extent, since opportunities for experimentation appear limited.

In particular, we are having to learn how much can be obtained from past data, originally gathered for some other purpose, for example, in connection with the administration of a program. Since the data are already there, the method is much speedier than a fresh start would be. In cost, it may mean the difference between \$5,000 and \$150,000. Although the past data are seldom what we would like to have if we were doing the job anew, yet often there are masses of it, and perhaps it will be possible to select what we need.

Although it is difficult to generalize, experience with past data has been disappointing. It has often given a confused picture from which no clear leads can be drawn, and it has sometimes given leads that turned out to be the wrong ones. The main difficulties appear to be that the definitions used in the data are not rigorous and clear-cut enough for scientific investigations, and that the effects that we wish to study are inextricably tangled up with other effects. Some of my own disappointments with past data remind me of a statement made by Available Jones in the Little Abner comic strip. Available Jones makes his living in part by giving advice. He has two kinds of advice, the 10-cent and the 50-cent kind. Of the 10-cent kind, he says (after some modifications of his spelling): "For 10 cents, I barely listens—in fact I yawns in your face, and the cheap advice you gets will do you more harm than good."

In many human studies, workers are realizing that they must face the long and hard business of planning new observations in order to obtain the 50-cent advice. I do not mean, however, to condemn the use of past data in any outright manner: if a few factors predominate, this should be revealed, and very often, past data are all that we have. Moreover, I owe my first post, in the depression, mainly to the fact that my employers had a large batch of past data which were regarded as a potential mine of information. They hired me to dig it out. I dug

furiously, but I doubt whether they received their money's worth. Fortunately, my salary was so low that this moral problem caused me no loss of sleep.

In new studies, we are having to learn how much ground can be covered, that is, how many different questions can be investigated in a single study. At the moment, the lesson seems to be not to be too ambitious. This can be illustrated with respect to one approach to exploratory studies that might be called the method of casting the net widely, if you happen to like it, or the method of shooting blindly in all directions, if you don't happen to like it. Suppose that there is some phenomenon about which not much is known, and we are trying to discover which factors or variables have the most predominant influence on it, or are at least most clearly associated with it. It seems rational to write down all the factors that are likely to have an influence on the phenomenon, include them in the study, and rely on statistical techniques, particularly those of multiple classification or regression, to reveal the most important ones. I know of no one as clever as the social scientist at writing down a ten-page list of factors that might influence any given phenomenon. For the relatively poor results given by this method, the statisticians may be partly to blame, because they may have oversold the power of statistical techniques to unscramble an omelet. If nature mixes things up thoroughly, as she sometimes seems to do, statistical methods will not sort them out very well. Indeed, the more factors that are included in the study, that is, the more painstaking the scientist is, the harder it becomes to disentangle all their effects. Many studies now go to the opposite extreme, concentrating on learning something about a single factor, such as differences between premature and normal children, or between public and slum housing. This means slow progress, and perhaps with more experience some intermediate method will prove rewarding.

Social scientists are having to learn how to observe the same people over a period of years, as in the study of chronic diseases or of the effects of administrative programs. Such studies are

expensive and hazardous, because it is difficult to foresee the contingencies that may arise to plague us. For one thing, the human subjects won't stay where they are: off they go to Portland or Honolulu, and if we cannot find means to keep observing them, the group under study dwindles year by year to a remnant consisting of the most settled families. Sometimes it is the scientist who is off to Rangoon or Monte Carlo. My guess would be that we now know how to observe groups for as long as three years, and perhaps for as long as five years: beyond that, there are too few successfully completed studies to be able to say that the technique has been mastered.

In such long-term studies the subjects are sometimes influenced by the fact that they are being studied, in a way that vitiates the purposes of the study. I have heard of farm management studies of poor farmers where the list of questions opened the eyes of some of the farmers to financial opportunities that had never occurred to them. In a few years, these farmers were offering the interviewers jobs. In the British study of smoking and cancer, the Medical Research Council's scientists became alarmed at the number of doctors who replied to the original questionnaire by saying "I have been smoking twenty cigarettes a day, but after reading this questionnaire I have given up smoking for ever."

These long-term studies require, for their direction, a type of scientist who is quite different from the "ivory tower" concept of a scientist. He must be able to assemble a team of workers and to maintain good relations among them: he must obtain the cooperation of various administrators and their agencies, and must handle a considerable amount of paper work. Scientific competence alone does not guarantee success in this type of research: some scientists are too shy, and others too quarrelsome, to meet the requirements.

Social scientists are also having to learn to exercise the kind of ingenuity that is delightful when it comes off. Nature occasionally provides golden opportunities to study some group that will be particularly revealing, as with identical twins who

have been reared under different circumstances, or with groups of people who have been long isolated. Ingenuity may also enable us to take the difficult step from correlation to causation. If we have established correlation between two variables A and B in an observational study, we may *think* that A is the cause of B, but nobody saw the murder committed, and the evidence pointing to A as the culprit is only circumstantial. But if by ingenuity we can build up a series of separate pieces of evidence, all pointing to A, it becomes harder and harder to think of an alternative hypothesis that will explain them all away simultaneously. In this connection the social scientist has to use the methods of the detective, the good criminal lawyer, and even the man who is trying to prove that Bacon wrote Shakespeare.

As I have indicated, the use of the more powerful method of experimentation has been small. The obstacles with human subjects are obvious. Yet with persistence and tact, the difficulties can sometimes be overcome, and it may be that experimentation will come to play a more important role than it now does. In medical research on the prevention and cure of disease, some notable successes have been scored by experimentation, and experiments are now being attempted that would, I believe, have been considered impossible a few years ago. The main problem is to secure the tightness of control that is essential for a good experiment, without relaxing the ethical requirement that the welfare of the patient is the paramount consideration.

The trial of the polio vaccine conducted this summer is an example. In some of the states, this trial was made by a method that I would describe as observational, but in others, involving hundreds of thousands of children, the trial was a genuine experiment. The children were divided into two groups at random. Those in one group received, at intervals, three shots of the vaccine. Those in the other group received in the same way three shots of an inert substance that is expected to have no effect. No one in the areas concerned knows which child received vaccine and which control. This, in fact, is known to

very few persons, and it will not be revealed until necessary in the final stages of the analysis.

A second example is an international cooperative experiment on drugs for the treatment of leprosy, conducted under the leadership of the Leonard Wood Memorial, that was an organizational masterpiece. The same six drugs were tested at the same time in three different institutions, with uniform methods of measuring and recording the dermatological, neurological and bacteriological progress of the patients, and with random allotments of patients to drugs. One institution was in Japan, one in the Philippines, and one in Pretoria, South Africa. In fact, the chief barrier to progress in this line of research is probably a deficiency in tools of measurement. Since no experimental animal has been found in which leprosy can be studied in the laboratory, it is difficult to obtain clues as to the most promising types of drug to test in the future.

SUMMARY

The quantitative study of human beings, particularly in their social aspects, is a young field. Because of the multitude of critical problems in human relations facing the world today, research workers are trying to obtain helpful answers on practical questions with rather crude tools of measurement and none too powerful methods of investigation.

In hazarding a few suggestions about the use of resources in this area of research, I should make it clear that I have not surveyed the present use of resources in any adequate way. It may be that my suggestions are already being prosecuted as vigorously as seems worth while.

The field needs to devote ample resources to improving its tools of measurement. This is best done by workers who do not have to produce answers to practical questions at the same time. Raymond Pearl used to urge biologists to stop beating their breasts about the difficulty of doing accurate work in biology. If the biologists would devote as much brains, energy and care to refining their measurements as the physicists do, he

claimed that they would obtain as accurate results. Although I think he promised too much, the amount of research that physicists devote to measuring devices as such is impressive, and the returns are equally so. In the social sciences, the work of the psychometricians in the construction of scales is a good beginning. I have heard some hard words about the Rorschach test, but both orthodox and unorthodox methods of measurement should be developed and tried.

Experimentation (in the sense in which I have used it) needs to be exploited as much as possible. The question: "Why can't I do an experiment?" is always worth asking, even if it sounds unrealistic. There may be many opportunities for simple experiments using students as volunteers. A colleague, one of the few men still working on the discouraging task of producing a vaccine for the common cold, finds his volunteer subjects among the convicts.

A balance should be retained between studying what people say they will do and studying what they actually do. Here there is perhaps a contrast between economics and sociology. The economist has kept a close eye on what people do, but has tended to rely on armchair reasoning to uncover the motives for their actions, to the neglect of attempts to study motives independently. The sociologists have been enterprising in tackling the difficult task of studying motives, but they need also to be constantly checking reported motivations against actions.

In addition to scientists engaged in large-scale studies, the field needs a supply of those German animals (in the quotation from Russell) who sit still and think. These might be younger scientists with steady incomes, but with restricted research budgets.

Finally, the field needs to keep strong lines of communication with other branches of science, and particularly with biology, and to recruit some of its research workers from these other branches. For certain research problems, the "interview" method of obtaining data is likely to prove inadequate, and progress may have to await new measuring techniques that are

adapted from developments outside of social science. The need for links with biology is obvious: man is biological as well as social; moreover, although biology has access to more powerful and flexible research techniques than social science, many of the problems are the same.

In conclusion, I hope that my comments have not sounded pessimistic. If there is one lesson to be learned from the history of science, it is that the optimists are always right, except that they should have been more optimistic.

NUTRITIONAL STATUS OF INDUSTRIAL WORKERS^{1,2}

II. EFFECTS OF EDUCATION, AGE, INCOME, AND ETHNIC GROUPS

M. J. BABCOCK, HELEN N. CHURCH, AND LORRAINE O. GATES

INTRODUCTION

IN the previous paper of this series (Babcock, *et al*, 1954) an arbitrary procedure was used to classify the nutritional status of 600 male industrial workers on the basis of their individual dietary, blood, and physical findings. The characteristics of the group classified as having suboptimal nutrition with respect to one or more vitamins were then compared to the characteristics of the entire sample. The characteristics were generally similar, but the suboptimal group included slightly higher percentages of men over 40 years of age, men with low incomes, men doing very active work, and Negroes; and slightly lower percentages of men with advanced educations.

Results such as these, in which nutritional status appears to be related to various factors, are difficult to evaluate because many variables may be affecting the results simultaneously. For example, the finding that men with advanced education had better nutritional status might have been caused by more intelligent selections of diets, or it might be that, having higher incomes, these men could afford more of the protective foods. In this paper an attempt is made to evaluate separately the effects of education, age, and income on nutritional status by studying samples that are comparable with respect to major variables other than the one under study. Observations are also made on the effects of food habits of different ethnic groups on nutritional status.

¹ Paper of the journal series, New Jersey Agricultural Experiment Station, Rutgers University, the State University of New Jersey, Department of Agricultural Biochemistry, New Brunswick.

² This paper is the result of work done as part of the Nutritional Status Project NE-4 conducted cooperatively by agricultural experiment stations of the Northeastern Region, supported in part by 9B3 funds appropriated under the Research and Marketing Act of 1946.

CONTROL OF EXTRANEOUS VARIATION

Ideally, all variables should be controlled except the one under study. The following variables have frequently been considered in nutritional surveys (National Research Council, 1943): Sex, age, education, occupation, income, family size, ethnic group, size and type of community, geographic region, year, season, and reliability of data collected by various techniques. In the study reported here, variation due to sex, occupation, size and type of community, and geographic region were largely avoided by restricting the sample to male industrial workers employed in chemical and pharmaceutical plants located in industrial communities in central New Jersey. Yearly and seasonal variations were limited by restricting the collection of data to a two-year period (1949-1950) in which wages and food prices were relatively stable, and by making no studies during the summer months. Variation in family size was assumed to have its effect largely on the income available for buying food, and was, therefore, considered in defining the income groups. Variation in education, age, income, and ethnic groups were controlled by selecting samples equally represented, so far as possible, with respect to these variables (except for the variable being studied). Variation in the reliability of the data was minimized by using the same techniques throughout (Northeast Region, 1951).

EDUCATION EFFECT

Selection of Comparable Samples. To determine whether the previously noted variation of nutritional status with educational level was directly associated with the educational levels or indirectly with other variables, samples comparable with respect to other variables listed above were selected for each of the following four different educational levels: 8th grade or less; 9th, 10th, and 11th grades; high school graduates; and one or more years of advanced education. These groupings provide a measure of the general education of the workers, but do not specifically indicate the amount of education in nutrition that

either the workers or their wives had. To obtain comparable samples the number of subjects in each educational group was reduced as necessary to leave samples with equal percentages (± 1 per cent) of men age 20-29, with equal percentages of men age 30-39, and with equal percentages of men age 40-69 in each educational group. Concomitant with this adjustment, the number of subjects in each of these educational groups was reduced as necessary to leave samples with equal percentages (± 1 per cent) of men with low income, equal percentages with moderate income, and equal percentages with high income in each educational group. The income classifications were based on the household income, modified for family size, as previously defined (Babcock, *et al*, 1954). For example, a physically active man and wife whose total income was between \$38 and \$57 per week, were classified as having moderate income. In reducing the numbers of subjects to obtain samples represented equally with respect to age and income distributions, care was taken to maintain approximately the same proportions of each ethnic group in the different samples. The representative samples chosen in this manner were then further checked to establish that they had approximately the same percentages of subjects in each work activity group (sedentary, physically active, or very active). Because of the limited number of subjects, it was not always possible to have the samples completely unbiased with respect to each of these variables. The exceptions which might be significant were as follows:

a. The highest education group included no Negroes, in contrast to 7-10 per cent Negroes in the other groups.

b. With increasing educational level the proportion of very active workers decreased from 54 per cent to 21 per cent. The advanced education group had 48 per cent sedentary workers compared to 5-13 per cent for lower educational levels.

Results. When the effects of age, income, etc. were removed by selecting samples comparable with respect to these variables, the variation in percentages of subjects classified as having

	8TH GRADE OR LESS (93 SUBJECTS)			9, 10, 11TH GRADE (95 SUBJECTS)			HIGH SCHOOL GRADUATES (60 SUBJECTS)		
	High	Mod- erate	Low	High	Mod- erate	Low	High	Mod- erate	Low
Protein	90	9	1	82	18	0	85	15	0
Calcium	47	33	21	52	27	21	55	27	18
Phosphorus	64	33	3	63	34	3	68	30	2
Iron	91	18	1	85	15	0	82	18	0
Vitamin A	85	4	1	94	4	2	93	7	0
Thiamine	67	33	1	59	41	0	62	38	0
Riboflavin	73	26	1	63	36	1	73	27	0
Niacin	88	12	0	84	16	0	90	10	0
Ascorbic Acid	71	29	0	70	30	0	75	23	2

Table 1. Percentage of subjects in each dietary rating based on the dietary histories.

suboptimal nutrition was less pronounced than had been observed in the total sample. Only the highest educational level remained appreciably different from the others. Of the men who had one or more years of education beyond high school, 14 per cent (8 subjects) were classified as having suboptimal nutrition with respect to one or more vitamins in contrast to 27-30 per cent for men who had less education.

As the above classification of nutritional status is an arbitrary one based on part of the dietary, blood, and medical data from each subject, it is of interest to analyze each of these types of data separately to determine which, if any, were associated with educational level. The dietary history as obtained by interview, the blood analyses, and the physical findings are discussed in the following paragraphs.

Dietary Findings. Caloric intakes and their standard deviations calculated from the dietary histories for each educational group were as follows:

8th Grade or Less	3,108 ± 868. Calories
9th, 10th, and 11th Grades	2,983 ± 886. Calories
High School Graduates	3,047 ± 870. Calories
One or More Years of Advanced Education	3,079 ± 726. Calories

The percentage of subjects in each dietary rating, as pre-

ADVANCED EDUCATION (56 SUBJECTS)		
High	Moderate	Low
93	7	0
61	30	9
73	27	0
98	2	0
95	5	0
59	41	0
88	12	0
82	18	0
77	23	0

viously defined (Babcock, *et al*, 1954) is given in Table 1. These data show that nutrient intakes, as measured by the dietary histories, were generally similar for all educational levels, but that high intakes of calcium, phosphorus, vitamin A, and riboflavin occurred somewhat more frequently in the higher education groups.

To provide further information on the effects of education on dietary habits a study was made of the consumption of certain food groups. Random samples of the dietary his-

tories from each of the four education samples in this study were used. Table 2 gives the average contribution of each food group to the total caloric intake for each educational level. There was some tendency for the consumption of dairy products to increase, and for starchy foods to decrease as the educational level increased, but the differences were small and not entirely consistent.

Blood Findings. The percentage of subjects in each blood chemistry rating, as previously defined (Babcock, *et al*, 1954) is given in Table 3. These data indicate that blood levels of vitamin A and hemoglobin were generally similar for all educational levels, but that high serum levels of carotene and as-

Table 2. Percentage of the total caloric intake supplied by several food groups.

	8TH GRADE OR LESS (32 SUBJECTS)	9, 10, 11TH GRADE (32 SUBJECTS)	HIGH SCHOOL GRADUATES (30 SUBJECTS)	ADVANCED EDUCATION (28 SUBJECTS)
Fluid Milk	7.8	11.0	10.9	10.8
Milk Products ¹	2.8	3.3	4.1	2.5
Total Dairy ¹	10.6	14.3	15.0	13.3
Bread	16.0	11.7	12.4	11.4
Sweet Rolls	0.8	1.2	1.3	0.7
Total Breadstuffs	16.8	12.9	13.7	12.1
Potatoes	8.1	7.0	8.5	6.5

¹ Excluding butter.

	8TH GRADE OR LESS (93 SUBJECTS)			9, 10, 11TH GRADE (94 SUBJECTS)			HIGH SCHOOL GRADUATES (57 SUBJECTS)		
	High	Mod- erate	Low	High	Mod- erate	Low	High	Mod- erate	Low
Vitamin A	92	6	1	95	3	1	97	4	0
Carotene	56	34	10	69	20	10	72	23	5
Ascorbic Acid	39	33	28	42	34	24	47	32	22
Hemoglobin	84	13	3	87	12	1	84	10	5

Table 3. Percentage of subjects in each blood chemistry rating.

corbic acid occurred with increasing frequency as the educational level increased.

Physical Findings. The frequencies of twenty-two individual clinical signs possibly related to nutritional status (Babcock, *et al*, 1952) were generally similar for all educational levels. Men with advanced education, however, had less gingivitis (13 per cent) than men in the other groups (22 per cent to 26 per cent).

To relate the individual physical findings to nutrients, they were combined by an arbitrary procedure into composite physical ratings, as previously described (Babcock, *et al*, 1954). The percentages of subjects having each composite physical rating are given in Table 4. The frequencies with which the examining physicians rated the subjects' general physical appearance as good, fair, or poor, and the incidence of underweight and overweight, are also listed in this table. These data show that the physical ratings of nutritional status were generally similar for all educational groups, but that high ratings occurred with slightly greater frequency in the higher education groups for vitamin A, niacin, and ascorbic acid. Overweight (by 10 lbs.) was found most frequently in men who had the equivalent of 9 to 11 years of formal education.

Statistical Analysis. The dietary, blood, and physical data agreed in showing that the nutritional states of the four educational groups were generally similar, but that with several measures there was a tendency toward higher nutritional status as

ADVANCED EDUCATION (56 SUBJECTS)		
High	Mod- erate	Low
92	7	0
76	20	4
60	20	20
89	9	2

the education level was increased. Where numerical (dietary and blood) data were available, such tendencies for correlation of nutritional status with educational level were analyzed statistically. Correlation analyses were made using the same 300 men, but they were further divided into each number of years of schooling, ranging from less than 8th grade (counted as 7 years of schooling)

to Ph.D. (counted as 19 years of schooling). The nutrient levels were also divided into ten or more small groups for this analysis. For the dietary history data discussed in connection with Table 1, the correlation coefficients were: calcium, 0.236; phosphorus, 0.169; vitamin A, 0.027; and riboflavin, 0.105. For blood carotene and ascorbic acid (*cf.* Table 3) the correlation coefficients were 0.051 and 0.139, respectively. These coefficients confirm the frequency tabulations in showing a slight positive correlation of educational level with certain measures of nutritional status. The correlation coefficients are relatively low, however; only those for calcium and phosphorus are significant at the 1 per cent level, and only blood ascorbic acid at the 5 per cent level. Also, for the advanced education group, the tendency of the blood and physical findings to indicate better nutritional status may have been caused in part by a higher consumption of vitamin supplements. Twelve per cent of this group took vitamin supplements in contrast to 3-5 per cent for the other educational groups.

AGE EFFECT

Selection of Comparable Samples. A study of the effect of age level on nutritional status was set up directly analogous to the study of the education effect. Samples comparable with respect to education, income, and ethnic groups were selected for three age groups, 20-29, 30-39, and 40-69 years. These three samples were also comparable in other characteristics.

Results. The percentage of subjects classified as having sub-

Table 4. Percentage of subjects in each composite physical rating, physical appearance rating and weight rating.

COMPOSITE PHYSICAL RATING	8TH GRADE OR LESS (93 SUBJECTS)			9, 10, 11TH GRADE (95 SUBJECTS)			HIGH SCHOOL GRADUATES (60 SUBJECTS)			ADVANCED EDUCATION (56 SUBJECTS)		
	High	Moderate	Low	High	Moderate	Low	High	Moderate	Low	High	Moderate	Low
Vitamin A	80	14	5	87	10	2	90	10	0	87	11	2
Thiamine	99	1	0	98	2	0	97	2	2	97	4	0
Riboflavin	78	16	5	74	21	5	75	20	5	80	18	1
Niacin	80	10	10	84	13	2	85	10	5	87	11	2
Ascorbic Acid	86	13	1	83	17	0	85	15	0	95	5	0
Appearance	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
	86	13	0	84	17	0	84	17	0	85	14	0
Weight Rating	Under-weight	Normal	Over-weight	Under-weight	Normal	Over-weight	Under-weight	Normal	Over-weight	Under-weight	Normal	Over-weight
	20	38	42	19	28	53	22	40	38	23	37	39

optimal nutrition with respect to one or more vitamins was similar for all groups; 28 per cent for age 20-29 and 25 per cent for each of the higher age groups. Inspection of the overall vitamin ratings for each vitamin, however, did show an apparent age effect for ascorbic acid. The percentage rated suboptimal in ascorbic acid increased from 8 per cent to 14 per cent and 18 per cent with increasing age levels.

Because of space limitations, the dietary, blood, and physical findings are not tabulated here by age groups. The dietary history data were generally similar for all age groups, except that men 20 to 29 years of age consumed an average of approximately 200 calories more per day than older men. The greater caloric intake of the younger workers probably accounts for the fact that they had higher frequencies (by about 10 per cent) of men with high nutrient intakes. For thiamine, the difference was larger; 80 per cent high intakes for age 20 to 29 compared to 60 per cent for older men. Correlation analyses of the same 272 subjects, classified into 5-year age groups, showed no significant correlation of age with dietary protein, riboflavin, niacin, or ascorbic acid, but gave a correlation coefficient of -0.165 (significant at the 1 per cent level) for thiamine.

The blood levels of vitamin A, carotene, ascorbic acid, and hemoglobin were similar for all age groups.

The frequency of individual physical signs, except for gingivitis, xerosis and tongue papillae, was similar for all age groups. The incidence of xerosis of the skin and changes in papillae of the tongue were 15 per cent higher in men age 20-29 than in older men. A consistent increase in all degrees of gingivitis

Table 5. Percentage of subjects having different degrees of gingivitis.

	AGE 20-29 (65 SUBJECTS)	AGE 30-39 (150 SUBJECTS)	AGE 40-69 (57 SUBJECTS)
Normal	92	82	72
Mild	5	8	9
Moderate	3	9	12
Severe	0	1	7

	AGE 20-29 (65 SUBJECTS)	AGE 30-39 (150 SUBJECTS)	AGE 40-69 (57 SUBJECTS)
Underweight by 10 Lbs.	25	14	39
Normal Weight	34	37	33
Overweight by 10 Lbs.	41	49	28

Table 6. Percentage of subjects in each weight rating.

with age is shown by the data in Table 5. The composite physical ratings were similar for all vitamins, except ascorbic acid, which reflected the incidence of gingivitis. Men 30 to 39 years of age were relatively heavier than older and younger men (Table 6).

INCOME EFFECT

Selection of Comparable Samples. A study of the effect of income on nutritional status was set up directly analagous to the studies of education and age effects. Samples comparable with respect to education, age, and ethnic group were selected for three income groups. The income classifications were based on the household income, modified for family size, as previously defined. The three income samples were comparable with respect to other variables except that the high income group had a higher percentage of sedentary workers (24 per cent vs. 13-15 per cent).

Results. The percentage of subjects classified as having suboptimal nutrition with respect to one or more vitamins was similar for all groups; 28 per cent for the low income group (118 subjects), 23 per cent for the moderate income group (132 subjects), and 27 per cent for the high income group (74 subjects). Inspection of the overall vitamin ratings for each vitamin, however, did show an apparent income effect for ascorbic acid. The percentage rated suboptimal in ascorbic acid decreased from 19 per cent to 12 per cent and 10 per cent with increasing income levels.

Because of space limitations, the dietary, blood, and physical findings are not tabulated here by income group. The dietary history data were generally similar for all income groups,

except that the low income group had low intakes of calcium more frequently (25 per cent vs. 16-17 per cent), and had less men (65 per cent vs. 73 per cent) who received the recommended allowance of ascorbic acid. The blood data showed a similar small difference in ascorbic acid; 41 per cent of the low income group had high serum levels compared to 48 per cent of the other income groups. The composite physical ratings also showed a slightly lower percentage of subjects with high ascorbic acid ratings in the low income group. The moderate income group had a lower incidence (17 per cent) of increased vascularity of the bulbar conjunctiva than the other groups (33 per cent and 30 per cent). The moderate income group had relatively higher body weights; 54 per cent were overweight compared to 40-41 per cent for the other groups and 13 per cent were underweight compared to 25-28 per cent for the other groups.

Since the effects of income on the dietary and blood findings appeared to be limited to the low income group, correlation analyses were not made. The effects of income on the consumption of certain food groups was studied on random samples of the dietary histories from each of the three income samples used in this study. Table 7 shows that low income subjects obtained relatively less of their calories from dairy products and slightly more from bread than did higher income groups.

Table 7. Percentage of the total caloric intake supplied by several food groups.

	LOW INCOME (30 SUBJECTS)	MODERATE INCOME (34 SUBJECTS)	HIGH INCOME (37 SUBJECTS)
Fluid Milk	8.8	12.4	10.75
Milk Products ¹	2.7	2.8	3.6
Total Dairy ¹	11.4	15.3	14.3
Bread	13.2	11.8	12.0
Sweet Rolls	.6	1.3	.8
Total Breadstuffs	13.9	13.1	12.7
Potatoes	8.1	6.5	7.8

¹ Excluding butter.

ETHNIC EFFECT

The dietary patterns of the industrial workers were dominantly American, but in many cases were influenced by the race or nationality of one or more members of the household. Such influence, recorded during the dietary interview, was used to classify the subjects into ethnic groups. Where no other race or nationality background had an influence, the subjects were classified in the "American" ethnic group, which was then used as a standard for comparing the influence of other ethnic groups.

Because of the small numbers of subjects in some ethnic groups, it was not possible to select ethnic group samples representative with respect to education, age, and income. However, since the above studies have established that education, age, and income had relatively small effects on nutritional status, it is of interest to compare the findings for different ethnic groups, using the total sample in each case.

Results. The proportion of subjects classified as having sub-optimal nutrition with respect to one or more vitamins was 23 per cent for the American (reference) group (225 subjects), 40 per cent for Negroes (55 subjects), 41 per cent for Germans (31 subjects), 29 per cent for Italians (48 subjects), and 22 per cent for the Slavic group (185 subjects).

The dietary histories showed similar nutrient intakes for all ethnic groups, except Negroes. The Negroes' average caloric intake ($3,344 \pm 960$) was significantly higher than that of the reference (American) group ($2,958 \pm 857$). Their greater caloric intake resulted in significantly higher intakes of most other nutrients also. This higher food consumption was associated with a larger proportion (67 per cent vs. 26 per cent) of the Negroes who were engaged in very active work, rather than with overweight, which was more common (41 per cent vs. 29 per cent) in the reference group. Despite significantly higher intakes of ascorbic acid, iron and protein, calculated from the Negroes' dietary histories, their blood analyses showed significantly lower average levels of serum ascorbic acid and hemoglobin. Negroes showed higher incidences of clinical signs pos-

sibly related to deficiencies of riboflavin, niacin, ascorbic acid and vitamin A than the American reference group. The 31 German subjects also had higher incidences of clinical signs possibly related to deficiencies of riboflavin and niacin than the American group. The Italian group had a significantly higher dietary vitamin A intake and higher serum carotene level than the reference group, but also had a higher incidence of clinical signs possibly related to deficiency of riboflavin. Aside from the above-mentioned differences, the dietary, blood, and physical findings were generally similar for the five ethnic groups.

DISCUSSION

Although some extraneous variation could not be avoided, it is felt that the uncontrolled variation remaining after the careful selection of samples probably had little effect on the nutritional status findings.

Increasing the level of general education had an apparently beneficial effect on dietary intakes of calcium, phosphorus, vitamin A, and thiamine, blood serum levels of carotene and ascorbic acid, physical signs possibly related to deficiencies of vitamin A, niacin, and ascorbic acid, and the combined dietary-blood-physical rating for ascorbic acid. However, most of these trends were not consistent throughout all educational levels and, therefore, were not found to be statistically significant in the correlation analyses. Although statistically significant correlation coefficients were found for educational level with dietary calcium and phosphorus, and serum ascorbic acid, these coefficients were so low that they carry little practical significance. Since large numbers of even the highest educational group failed to meet the National Research Council Recommended Dietary Allowances and other standards used in this study, efforts to improve nutrition should be directed to all groups of industrial workers, including men with advanced educations.

Age differences were noted in the larger appetites of men in their twenties, but only the thiamine intake showed a statistically significant decrease over the entire age range, and this

correlation was of low order. Although the incidence and severity of gingivitis increased with age, no appreciable age variation was revealed by the blood findings. Sinclair (1948) has pointed out that, since people without teeth seldom have gingivitis, the apparent incidence of gingivitis will increase and then diminish with age. The general picture is one of similar nutritional status for industrial workers of all ages.

An association between family income and nutritional status was noted only at the low income level. Men in the low income group had slightly lower intakes of calcium due to lower consumption of milk. They also had slightly poorer ascorbic acid nutriture, as revealed by the dietary, blood, and physical findings. It should be noted that all subjects studied had regular incomes; greater effects of income on nutritional status would likely have been observed if the sample had included unemployed families, as in the recent study of pregnant women by Jeans, *et al.* (1952). Our finding that relatively large numbers of even the highest income group failed to meet the standards used in this study confirms the observation of Jeans that "Education in nutritional requirements appears to be even more needed than increase in purchasing power for these families."

Data from unselected samples of subjects classified according to race and nationality suggested that, while the nutritional problems of Negroes may differ slightly from those of other ethnic groups, suboptimal nutrition was observed widely throughout all ethnic groups.

The findings reported here emphasize that industrial nutrition programs should be directed to all workers, rather than restricting them to certain education, age, income, or ethnic groups. Thus, suitable in-plant feeding facilities and nutrition education should be provided for office personnel, as well as for all shifts of workers in a plant.

SUMMARY

Independent effects of education, age, and income on the nutritional status of male industrial workers have been studied by comparing samples selected to be comparable, so far as pos-

sible, with respect to other variables likely to influence nutritional status. Comparisons have been made of dietary intakes, blood levels (vitamin A, carotene, ascorbic acid and hemoglobin), physical signs frequently associated with malnutrition, and arbitrary ratings based on a combination of these three kinds of data for each subject.

Increasing the number of years of schooling slightly improved the nutritional status, as measured by dietary intakes of calcium and phosphorus and serum ascorbic acid. Age appeared to have little effect on the nutritional status of these men, except for a slight decrease in thiamine intakes and increase in gingivitis with increasing years. Low family incomes were associated with low calcium intakes and poor ascorbic acid nutriture.

Although slight differences in nutritional status were attributed to effects of educational level, age, and income, the dominant trend was for evidence of suboptimal nutrition, and also obesity, to be widely distributed throughout all education, age, income and ethnic groups. The practical implications of these findings are that nutrition programs should be directed to all workers, rather than to certain education, age, income, or ethnic groups.

REFERENCES

Babcock, M. J.; Bryan, A. Hughes; Clayton, Mary M.; Foster, Walter J.; Lawless, J. J.; Tucker, Ruth; Wertz, Anne W.; and Young, Charlotte M.: Cooperative Nutritional Status Studies in the Northeast Region. II. Physical Findings. New Jersey Agricultural Experiment Station *Bulletin*, June, 1952, No. 763, pp. 1-28.

Babcock, M. J.; Church, Helen N.; and Gates, Lorraine O.: Nutritional Status of Industrial Workers. I. Dietary, Blood, and Physical Findings. *Milbank Memorial Fund Quarterly*, October, 1954, xxxii, No. 4, pp. 323-42.

Jeans, P. C.; Smith, Mary B.; and Stearns, Genevieve: Dietary Habits of Pregnant Women of Low Income in a Rural State. *Journal of the American Dietetic Association*, 1952, 28, pp. 27-34.

National Research Council: Inadequate Diets and Nutritional Deficiencies in the United States. *Bulletin* of the National Research Council, November, 1943, No. 109, pp. 1-32.

Northeast Region: Cooperative Nutritional Status Studies in the Northeast Region. I. Techniques. Cornell University Agricultural Experiment Station Memoir, March, 1951, No. 307, pp. 1-31.

Sinclair, H. M.: The Assessment of Human Nutriture. VITAMINS AND HORMONES. Academic Press 1948, 6, pp. 101-62.

THE RELIGIO-CULTURAL BACKGROUND OF NEW YORK CITY'S POPULATION

NEVA R. DEARDORFF¹

GOVERNMENTAL agencies including the United States Census Bureau are not permitted to question residents about their religious affiliation in inquiries about the characteristics of the general population. Therefore, no official data deriving from the people themselves now exist on this subject. All data on religion to be found in official volumes and such publications as the World Almanac come from organized religious bodies. The figures are based upon whatever membership standards these organizations employ and the records they may elect to keep. The national figures are aggregates of the particular territorial divisions in use by each denominational and sectarian group. Often these are not coterminous with political boundaries. From such data it is quite impossible to construct a picture of the broad religious groupings of given urban and rural communities throughout the United States.

For some specific administrative purposes, public agencies may ask people about their religious affiliation or background (children to be placed in foster homes, patients in hospitals, juvenile court cases, etc.), but the figures emerging from such questioning, when and if they do emerge for a local community, are not reliable guides to estimates for the religious groups in its total population. Moreover, without basic population figures to which these administrative data can be related, their publication has led at times to considerable "puzzlement" and not a little embarrassment. Hence there is often reluctance to make them public. It is only on the rare occasions when some voluntary agency makes a careful enumeration of a sample of the population that there is opportunity to learn about this rather significant phase of community life.²

¹ Consultant, Health Insurance Plan of Greater New York.

² For a description of the efforts that have been made to ascertain the size of the Jewish population see Robison, Sophia M.: Problems and Techniques in Jewish Demography. *Jewish Social Service Quarterly*, June, 1949.

Within the last twenty years there have been two occasions in New York City when sizable inquiries based on a sampling of the population have been made on this subject, both under voluntary auspices. The first of these was the youth study for the year 1935³ and the second was the survey made in 1952 by the committee in charge of a study of the experience of the Health Insurance Plan of Greater New York.

The Youth Survey. The Youth Study was conducted by the Research Bureau of the Welfare Council (now the Welfare and Health Council) with the aid of a large staff of field workers and technicians assigned by work relief agencies. Every one-hundredth dwelling unit throughout the five boroughs was spotted on the Real Property Inventory and thereafter was visited. All the young persons between the ages of 16 and 24 years residing in these units were interviewed at considerable length about their education, work experience, and recreational interests. Since many recreational organizations are operated and financed under sectarian auspices, it was pertinent to inquire of these young persons as to their religious backgrounds. It thus became possible to estimate the size of the youth population in areas throughout the City to which the various sectarian agencies were addressing themselves. The 9,041 young people were asked whether they were Catholic, Protestant, Jewish, or of other affiliation and were assured that they need not answer if they had any objection to the question. Only 2.2 per cent of the returns showed this item as "other" or "not reported." None of the reluctance that had been anticipated was encountered. For want of a better term, this affiliation was called adherence to a "religio-cultural" group.

When the returns for the youth study were tabulated the results indicated a distribution quite different from the then current beliefs and assumptions as to the relative size of these groups in the City. At first, there was doubt at the Research Bureau that they could be right. It was known that the sample

³ McGill and Matthews: *THE YOUTH OF NEW YORK CITY*. The Macmillan Company, New York, 1940.

itself was representative for population characteristics reported in the United States Census, but there is always the possibility of error either in the recording or tabulation of a new item. In order to check for these possibilities every return was carefully re-examined for other evidence—birthplace of parents, schools attended, membership in clubs, etc.—that would support or contradict the designation of religion. The reports proved to be internally consistent and the tabulations correct. The figures were then issued with full confidence in their accuracy. They showed that of these young persons, those of Catholic background appeared in 48.6 per cent of the total, Protestant in 17.8 per cent, Jewish in 31.4 per cent, other religions or not reported in 2.2 per cent. The distribution of *white* young persons showed 50.1 per cent Catholic, 32.7 per cent Jewish, 15 per cent Protestant, and 2.2 per cent other or not reported.

It was understood, of course, that no claim was made that all of these young persons were actively functioning members of churches, synagogues, or temples, or that their names were on church registers, or that if on such registers, they would remain so for the rest of their lives. The figures, however, did reflect their religio-cultural settings as of the time of the survey. At the very least, these would be the religious institutions to which they were most likely to turn for those forms of religious association of which they would feel any need and from which they might seek recreational services.

A question immediately arose as to the representative character of these figures when applied to the total, as distinguished from the youth population. Would the other age groups show approximately the same distribution? This question could not be categorically answered from the data of the youth survey, but it so happened that the Welfare Council's Research Bureau, again with the aid of the work relief administrations, was then conducting a statistical study of all persons discharged from hospitals, public and voluntary, in New York City in the year 1933. It is customary for hospital admission offices to record routinely the religious affiliation of patients. This is done not

as a requirement for admission, but in preparation for any emergency for which a clergyman would be called. Over 576,000 hospital discharges were included in this study. These referred, of course, to persons of all ages as they flowed through the 113 hospitals included in the study. When the figures were compiled, it was found that of the New York City residents, 47.3 per cent were Catholic, 22.2 Protestant, 19.0 per cent Jewish, 1.1 per cent of other religions and 10.4 per cent were not reported. Almost half of the reports without designation of religion were from hospitals operated under Jewish auspices which, as a matter of principle, refrained from inquiring about the religion of patients. It is a fair assumption that a large fraction of these patients were of Jewish background and that the 19 per cent specifically reported as Jewish would have been considerably augmented had these cases not been obscured. It was thought that the figures for the Protestants were a little inflated by reason of the comparatively high rate of admission to hospitals of Negroes, a high proportion of whom are Protestant. The striking similarity of the findings of the two studies as to the percentage of Catholic and Protestant groups raised a strong presumption that the youth study figures would hold for the total population.

The Study of the Health Insurance Plan (H.I.P.). As in the case of the youth survey, the 1952 study of the Health Insurance Plan of Greater New York made by an independent committee under the chairmanship of Dr. Lowell Reed, President of The Johns Hopkins University, included in its inquiry a question on religio-cultural background. For this inquiry two samples of population have been used, one an "area probability sample" of the total population of New York City and the other a random sample of the persons in households with one or more persons insured under the Plan.

The first sample covered 13,558 persons in 4,190 households, and the second 10,981 persons in 3,235 households. The data for these two groups—recorded by trained interviewers who visited the households—are subject to some sampling error, but

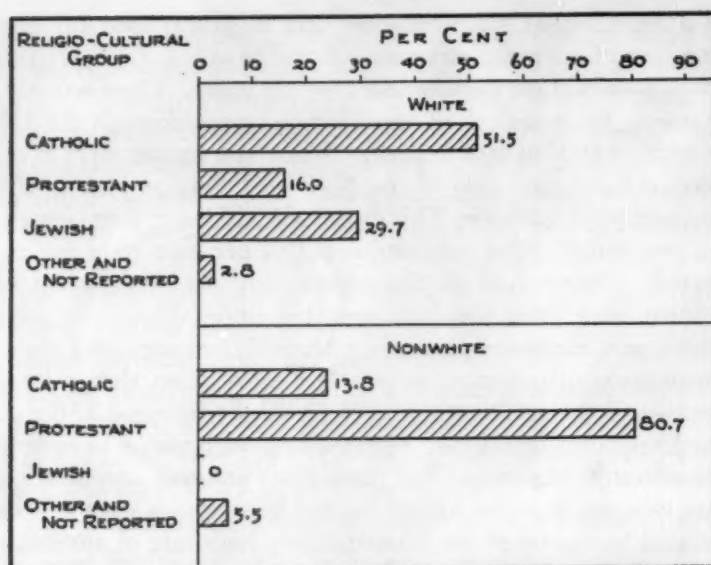


Fig. 1. Percentage distribution among religio-cultural groups of the white and non-white population in New York City, 1952.

when those for the City sample are compared with the 1950 census for common items, the sample stands up very well. The proportions of Catholic, Protestant and Jewish persons in the City sample and the H.I.P. sample followed the same general pattern though there was some deviation by reason of the fact that at the time of the survey, that is, the spring of 1952, the H.I.P. did not have quite as high a proportion of Negroes as obtains in the City as a whole. Correspondingly, it was found to be a little short in the relative number of Protestants when compared with the figures for the City. But the differences are not great, with a consequent reinforcement of the data for each sample and the thesis that the City sample faithfully reflects conditions in the total population.

Since the sample for the City is the primary object of interest here, the findings will be given in some detail for it in the statistical tables below. In brief, 47.6 per cent of the population was reported as in households headed by a person of Catholic

background, 22.8 per cent Protestant, 26.4 per cent Jewish, 1.6 per cent other and 1.6 per cent not reported. The question on religious affiliation—incidentally the last on a long schedule of

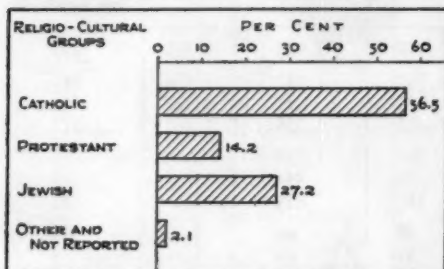


Fig. 2. White children under 15 years in New York City, percentage distribution among religio-cultural groups, 1952.

to talk about their religious connection, at least to an interviewer on a scientific inquiry.

Some changes occurred in the youth population between the years 1935 and 1952. The proportion of Protestants among persons aged 16 to 24 has advanced over that reported in the youth survey from 17.8 to 20.9 per cent. The figure for white Protestants declined from 15.0 per cent in 1935 to 13.9 per cent in 1952. The increase in Protestant youth has been due to the

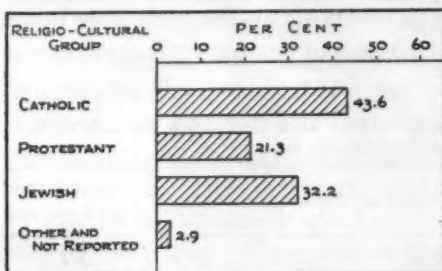


Fig. 3. White persons aged 65 years and over in New York City, percentage distribution among religio-cultural groups, 1952.

belief that in recent years Jewish people have been leaving New York City to go to the suburbs, to other parts of the United States, and even to other parts of the world. Their proportion

questions relating to matters of health and medical care—was one of the most completely reported. It would seem that religious freedom and tolerance in the City have come to be so widely taken for granted that people generally are not afraid

growth of the non-white population. The relative size of the Jewish youth population declined from 31.4 to 24.1 per cent. Considering only white youth, the Jewish contingent declined from 32.7 to 27.1 per cent. This corroborates the popular

RACE OF HEAD OF HOUSEHOLD	TOTAL	RELIGION OF HEAD OF HOUSEHOLD			
		Catholic	Protestant	Jewish	Other and Not Reported
TOTAL	13,558	6,459	3,088	3,581	430 ¹
White	12,094	6,240	1,933	3,578	343
Males	5,810	2,977	897	1,770	166
Females	6,284	3,263	1,036	1,808	177
Non-White	1,381	191	1,115	—	75
Males	601	74	484	—	43
Females	780	117	631	—	32
Not Reported	83	28	40	3	12
Males	35	10	21	—	4
Females	48	18	19	3	8

¹ Other religions, 214; not reported, 216.

Table 1. A sample of New York City's population, classified by race, sex and religio-cultural group, 1952.

in the total population could also have receded through the relatively greater increase in the size of other groups.

The accompanying statistical tables and charts set forth the figures on the distribution of the persons in each of the religio-cultural groups by age, sex and race. It should be reiterated that these data come from an "area probability sample" of 13,558 persons enumerated in New York City in the spring of 1952. They do not include members of families away from home in the armed forces or in college, nor permanently institutionalized persons.

Table 2. Percentage distribution of New York City's white and non-white population, each sex, by religio-cultural group, 1952.

RACE	TOTAL	CATHOLIC	PROTESTANT	JEWISH	OTHER AND NOT REPORTED
TOTAL	100.0 ¹	47.6	22.8	26.4	3.2
White	100.0	51.5	16.0	29.7	2.8
Males	100.0	51.2	15.4	30.5	2.9
Females	100.0	51.9	16.5	28.8	2.8
Non-White	100.0	13.8	80.7	—	5.5
Males	100.0	12.3	80.5	—	7.3
Females	100.0	15.0	80.9	—	4.1

¹ Includes 83 persons with race not reported.

AGE	TOTAL	CATHOLIC	PROTESTANT	JEWISH	OTHER AND NOT REPORTED
<i>White</i>					
TOTAL	100.0	100.0	100.0	100.0	100.0
Under 15	25.0	27.4	22.2	23.0	18.1
15-44	42.6	45.4	37.1	40.6	40.8
45-65	22.4	19.4	27.8	24.9	23.6
65 and Over	7.0	5.9	9.3	7.6	7.0
Not Reported	3.0	1.9	3.6	3.9	10.5
<i>Non-White</i>					
TOTAL	100.0	100.0	100.0	100.0	100.0
Under 15	32.4	22.0	35.4	—	13.3
15-44	42.4	48.2	41.7	—	36.7
45-64	15.9	18.4	14.9	—	25.3
65 and Over	3.9	5.7	3.3	—	6.7
Not Reported	5.4	5.7	4.7	—	18.0

Table 3. Percentage distribution of New York City's white and non-white population by religio-cultural group and by age, 1952.

These data are in the nature of a by-product of the Special Research Study of the H.I.P. which relates essentially to questions of illness, disability, medical care and health insurance. It is expected that the Project which has been financed by the Commonwealth Fund and the Rockefeller Foundation, will be completed within the next twelve months. The release at this time of these figures has been made in response to the request of other agencies, including the National Cancer Institute which is studying the incidence of some forms of cancer in these religio-cultural groups. The figures provide a population base to which data of other kinds can be related, and comparable rates for the several religio-cultural groups established.

The 13,558 persons in the sample are in the ratio of one to slightly less than 597 persons in the general population, estimated by the New York City Health Department as 8,089,000 on July 1, 1952. A rough approximation of the size of any segment of population shown in Table 1, can be obtained by multiplying the number there given for it by 597. The relative size of the religio-cultural groups shown here cannot be assumed to be uniform throughout each of the five boroughs that compose

AGE GROUP	TOTAL	CATHOLIC	PROTESTANT	JEWISH	OTHER, AND NOT REPORTED
<i>White</i>					
TOTAL	100.0	51.5	16.0	29.7	2.8
Under 15	100.0	56.5	14.2	27.2	2.1
15-44	100.0	55.1	13.9	28.3	2.7
45-64	100.0	44.5	19.8	32.7	3.0
65 and Over	100.0	43.6	21.3	32.2	2.9
Not Reported	100.0	32.9	19.2	38.0	9.0
<i>Non-White</i>					
TOTAL	100.0	13.8	80.7	—	5.5
Under 15	100.0	9.4	88.4	—	2.2
15-44	100.0	15.7	79.4	—	4.9
45-64	100.0	15.9	75.5	—	8.6
65 and Over	100.0	20.8	69.8	—	9.4
Not Reported	100.0	14.7	69.3	—	16.0

Table 4. Percentage distribution by religio-cultural group each age group, white and non-white population, New York City, 1952.

the City. Differences in racial and in age composition among the boroughs carry with them implications as to the proportionate size of each religio-cultural group within the respective borough. The several percentage distributions shown in Tables 2, 3 and 4 which contain religio-cultural distributions for sex, age and racial groups may be of help in working out estimates for the boroughs if there is any need for or interest in such figures.

DIFFERENTIAL FERTILITY IN MADISON COUNTY, NEW YORK, 1865

WENDELL H. BASH¹

THE hypothesis that the "normal" pattern of differential fertility in a population is that of a "J" shaped curve rather than a straight line inverse relationship between birth rates and social status has gained increasing acceptance in recent years. According to the interpretation of the history of these patterns, the straight line inverse relationship is a product of the diffusion of contraceptive information through a population, beginning in the upper classes and in the urban centers and spreading downward and outward. Most of our reliable information about differential fertility falls into the period of this transition, and actually toward the end of it as we can make out the cycle.² Verification of the "J" hypothesis depends upon the most recent census information in the United States and Europe,³ and this is necessarily incomplete. The surge in the birth rate of these nations during the 1940's and early 1950's is closely related to the rapidly rising marriage rate and consequent speeding up of family formation. Not until reproductive histories of this generation of wives is more complete can we be certain, even though there are many indications in census materials,⁴ of some real change in family size.

Another source of materials for the verification of the "J" hypothesis can be in the historical period before the beginning of this transitional period. Unfortunately, Western nations in this stage of the cycle rarely collected census information usable for this analysis, and this has also been true of those non-West-

¹ From the Department of Sociology, Colgate University. This study was made possible by assistance from the Milbank Memorial Fund and by the friendly advice and counsel of Clyde V. Kiser.

² For an exception, see Jaffe, A. J.: Fertility Differentials in the White Population in Early America. *Journal of Heredity*, 31, No. 9, September, 1940, pp. 407-411.

³ Edin, K. A. and Hutchinson, E. P.: *STUDIES OF DIFFERENTIAL FERTILITY IN SWEDEN*. London, P. S. King & Son, Ltd., 1935; Innes, John W.: *CLASS FERTILITY TRENDS IN ENGLAND AND WALES, 1876-1934*. Princeton University Press, 1938. Also, the entire "Indianapolis Study" is related to this problem.

⁴ Whelpton, P. K.: *COHORT FERTILITY*. Princeton University Press, 1954.

ern nations which today fall into the early stage of demographic development.⁵ Nevertheless, we can help to extend the time span within which we have substantially reliable information by referring to manuscript copies of some censuses.⁶ Published data help to provide a context for special studies.

The Census of the State of New York in 1865 is one such source inasmuch as it included a question on completed fertility. The published volume provided only a tabulation of the number of women who had had specified numbers of children, by county and for the native and foreign-born population, but the manuscript copies located in most of the court houses in the State make possible detailed tabulations by occupation and other measures of social status with age and marital condition controlled.

This study is concerned with 5,343 women in Madison County in 1865 with special attention to 4,300 of these women who were native white. Cards were prepared only for couples who had been married only once, thus omitting plural marriages for either spouse, widows, and women who were listed as married but with no husband listed on the household schedule.⁷

MADISON COUNTY IN RELATION TO OTHER COUNTIES

The editors of the New York State Census of 1865 expressed a faith that the returns were reasonably accurate on cumulative fertility. Instructions to the census takers were as follows:

11. *Of how many children the parent.*—This inquiry is to be made only of adult females, and usually of wives or widows. It should, in all cases, include the number of living children the woman has borne, *whether now living or dead, and whether present or absent* from the family. These children may perhaps be

⁵ Chen, Ta: Population in Modern China. *American Journal of Sociology*, LII, No. 1, Part 2, July, 1946.

⁶ Sydenstricker, Edgar and Notestein, Frank W.: Differential Fertility According to Social Class. *Journal of the American Statistical Association*, 25 (NS) 169: 9-32, March, 1930; Sydenstricker, Edgar: A Study of the Fertility of Native White Women in a Rural Area of Western New York. *Milbank Memorial Fund Quarterly Bulletin*, 10: 17-32, January, 1932.

⁷ In one tally of 3,453 married women, some 14 per cent were widowed, and 2 per cent were listed as married with no husband in the household.

themselves the heads of families, and residents of another state, or they may have died in childhood. The object of the inquiry is to obtain data for determining the natural increase of the population in this state among the various classes, and it should be taken fully and uniformly to possess value. Be careful to note in this column the number of children borne by females now aged, as well as that of those now surrounded by their families. We can thus determine the relative rate of increase of a former age, for comparison with the present.*

No detailed check of the completeness of this enumeration is possible on a statewide basis, since the published data included nothing on age or marital condition. Nevertheless, the editors' guess that the census was reasonably complete seems to be justified since the tables derived from the manuscript copies of the census include only eighteen wives for whom no information about fertility was obtained.

The published data on completed fertility indicate a generally negative relationship between the birth rate and urbanization and industrialization. The number of children ever born per 100 women was calculated for each county and for native and

Table 1. Correlations between native and foreign birth rates by counties and indexes of urbanization, New York, 1865.

	CHILDREN EVER BORN PER 100 NATIVE WHITE WOMEN	CHILDREN EVER BORN PER 100 FOREIGN- BORN WHITE WOMEN	PER CENT POPULATION FOREIGN BORN	NUMBER UNABLE TO READ AND WRITE PER 1,000 POPULATION	NUMBER OF PERSONS EMPLOYED PER 1,000 POPULATION
Population per Square Mile	-0.44*	-0.57*	0.72*	*	0.42*
Number of Persons Employed per 1,000 Population	0.10	-0.24	0.34	0.38	
Number Unable to Read and Write per 1,000 Population	0.13	0.30	0.38		
Per Cent Population Foreign Born	-0.50	-0.24			
Children Ever Born per 100 Foreign-Born White Women	0.48				

* Less than 0.01.

* Calculated without Kings, New York, and Richmond Counties because of their extreme departure from the density of other counties.

* Instructions for taking the Census of the State of New York, in the year 1865, Albany, Weed, Parsons & Co., 1865, p. 18.

foreign-born white women. These were then correlated with (1) the population per square mile, (2) the number of persons employed per 1,000 population, (3) the number unable to read and write per 1,000 population, and (4) the per cent of the population foreign born.

The inter-correlations between these factors (*see* Table 1.) show population density as being the most important single factor. Birth rates of native and foreign-born white women were positively related (0.48) and both of them were lowest in areas of high density with correlations of -0.44 and -0.57 respectively.

The geographical differentials in birth rates in 1865 can be compared with Anderson's⁹ data for 1930 with profit. The mountainous and hilly sections of the State had high birth rates, and these were generally isolated and rural. But a broad band through the central part of the State, the "David Harum"

Table 2. Cumulative birth rates for native and foreign-born white women living in New York State in 1865.

	TOTAL	NATIVE	FOREIGN BORN
<i>New York State</i> ¹			
Number Women Reporting	842,560	520,250	322,320
Number Live Births	3,088,233	1,857,151	1,231,082
Births per 100 Women	367	357	382
<i>Eight Counties</i> ²			
Number Women Reporting	81,847	67,939	13,908
Number Live Births	298,100	236,125	61,975
Births per 100 Women	364	348	446
<i>Madison County</i>			
Number Women Reporting	10,444	9,057	1,387
Number Live Births	36,201	30,126	6,075
Births per 100 Women	347	333	438
<i>Nine Townships</i> ³			
Number Women Reporting	5,301	4,522	779
Number Live Births	18,038	14,659	3,379
Births per 100 Wives	340	324	435

¹ Derived from pp 66-67, New York Census, 1865.

² Chenango, Genesee, Ontario, Orleans, Oswego, Otsego, Tompkins, Wayne.

³ Both husband and wife married only once, husband present. These rates are lower than the rest of the County because widows are not included, most of whom are in the older age brackets.

⁹ Anderson, W. A.: NATURAL INCREASE IN THE POPULATION OF NEW YORK STATE. Cornell University Agricultural Experiment Station Bulletin 733. Ithaca, N. Y., 1940.

part, was also prevailingly agrarian and had low birth rates. Among the counties in the lowest quartile of cumulative birth rates for native women in 1865 were the following near neighbors of Madison county: Otsego, Chenango, Tompkins, Ontario, Genesee, Orleans, Wayne, and Oswego, with only the last having a city of over 10,000 inhabitants. (*See Table 2.*)

If one accepts the hypothesis of urbanization and industrialization as being related to falling birth rates, then he must assume that low birth rates in these relatively prosperous, but fundamentally rural, counties are the product of early diffusion. The possibility that the analysis must be even more complicated may be indicated by the study of differentials according to nativity in the next section.

NATIVITY

In the Madison County sample wives born in Madison County had the lowest birth rate at all ages except under 25, and foreign born wives the highest. (*See Table 3 and Figure 1.*) Native women from New York and other states fell in between. When standardized by age the cumulative birth rates of these groups of white women were as follows: native to Madison County 289, born in New York State outside Madison County 315, born in the United States outside New York State 321, foreign born 418. Recognizing that birth rates of all three native groups were close at most ages, the fact that the Madison County wives were least fertile on all counts is considered significant. They have the highest percentage of childlessness and the lowest birth rate.¹⁰

Madison County was not selected for this study because it was considered representative of the upstate farming areas, but it is not far from it. The County was settled after 1790, largely by migrants from New England and the eastern counties. It has some good and some poor farm land. It has never been highly urbanized; but it has never been too isolated. The

¹⁰ Birth rates were also computed for mothers only. These come out as one would expect when the proportion childless is recognized. The tables are not reproduced here because they offer relatively little additional information.

AGE OF WIFE AND VARIABLE CONSIDERED	NATIVITY OF WIFE			
	Madison County	New York not Madison County	United States not New York	Foreign Born
<i>Number of Wives</i>				
Total Under 65	2,094	1,775	430	757
Under 25	369	266	22	68
25-34	708	536	58	275
35-44	547	414	83	229
45-54	326	347	130	134
55-64	144	212	137	51
<i>Children per 100 Wives</i>				
Total Under 65 (Not Standardized)	273	323	422	427
Under 25	95	87	105	122
25-34	199	213	224	315
35-44	343	362	390	534
45-54	430	472	448	539
55-64	469	579	551	671
Standardized Rate	289	315	321	418
Median Age of Wife	34.1	36.6	48.5	36.1
Per Cent Childless 45-54	10	7	10	6

Table 3. Cumulative birth rates by nativity of wife, Madison County, 1865.

Cherry Valley Turnpike pushed west across the middle of the County in 1806 and the Erie Canal later crossed the upper townships. By 1865 the Chenango Canal (Binghamton-Utica), the Seneca Turnpike, the Skaneateles Turnpike, and the New York Central Railroad provided other transportation.

Over half of the native-white population of Madison County was in agriculture, and among the native families the smallest ones were those most characteristic of the early life of the area, the two thousand wives native to Madison County. Clearly, the birth rate of this segment of the population was never very high, or the decline began very early. Compare, for example, the 1865 completed family (4.3 to 4.7 children) of the women native to Madison County with that for native white women in

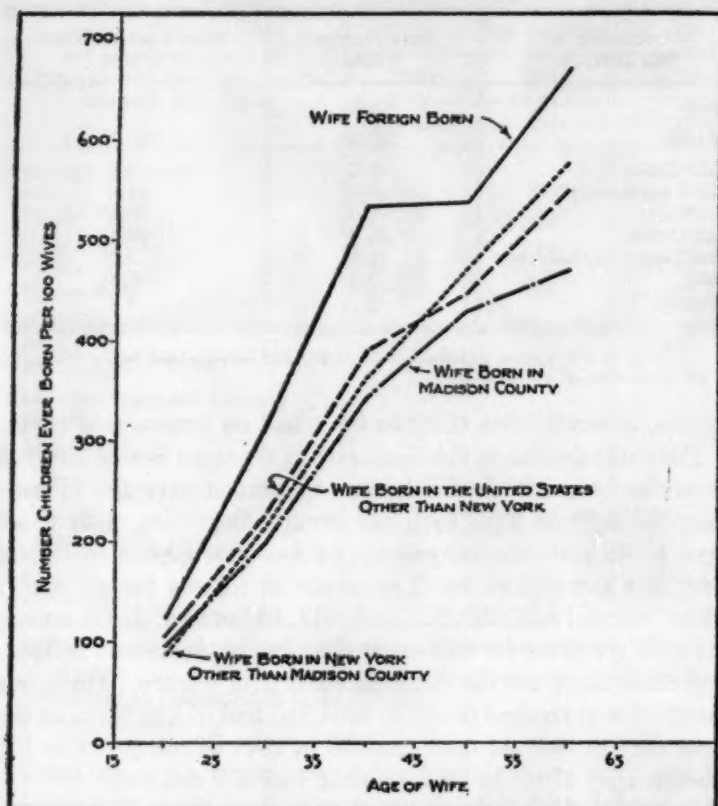


Fig. 1. Cumulative birth rates of married women by wife's nativity and by age.

the Northeastern Region in 1910 when the average woman of completed fertility had four children.¹¹

One may assume that New York State birth rates were somewhat depressed by the Civil War as they were in New England.¹² The nature of the data presented in this study demon-

¹¹ U. S. Bureau of the Census: *DIFFERENTIAL FERTILITY, 1940 AND 1910, WOMEN BY NUMBER OF CHILDREN EVER BORN*. Washington, Government Printing Office, 1945, Table 81.

¹² Spengler, J. J.: *The Fecundity of Native and Foreign-born Women in New England*. Brookings Institution, Pamphlet Series, Vol. II, No. 1, 1930.

OCCUPATION OF THE HUSBAND	WIFE NATIVE WHITE	WIFE FOREIGN-BORN WHITE
TOTAL	4,524	779
Per Cent	100.0	100.0
White Collar	10.8	2.5
Skilled and Semiskilled	19.5	15.2
Unskilled	8.2	35.6
Farm Owner	41.0	26.3
Farm Tenant and Laborer	15.9	15.8
None	1.1	0.5
Unknown	3.5	4.1

Table 4. Percentage distribution of native and foreign-born white wives, by occupation of husband.

strates, however, that this can have had no pronounced effect.

The early decline in the birth rate in this area is also inferred from the fact that the birth rates of women over age 45 continue to increase with each age group. Beginning with those aged 45-49 and increasing in age by five-year groups to 75 and over, the cumulative birth rates are as follows for all native white women: 429, 480, 523, 561, 613, 653, and 659. Of course, the ages given are for women at the time of the census in 1865, and these rates are for different cohorts of women. Thus, one hundred women aged 65-69 in 1865 had had 613 children at the time they completed their families in 1845 as compared to 100 women aged 45-49 in 1865 who had had 429 children.

Some fraction of these differentials according to age groups may well be attributed to a relationship between high birth rates and longevity. Dorn and McDowell found in the Australian statistics that the difference between the birth rates of women who died at advanced age and those who died in middle age could often amount to as much as twenty per cent.¹³ If the birth rate of native women aged 45-49 in 1865 is 100, then the rates of the older age groups in Madison County is as follows: 112, 122, 131, 143, 152, 154.

The birth rates of Dorn and McDowell are computed for

¹³ Dorn, Harold F. and McDowell, Arthur J.: *The Relationship of Fertility and Longevity. American Sociological Review*, 4: 234-246, April, 1939.

OCCUPATIONAL CLASS OF HUSBAND AND NATIVITY OF THE HUSBAND AND WIFE	AGE OF WIFE		
	25-34	35-44	45-54
	CHILDREN EVER BORN PER 100 WIVES		
<i>Skilled and Semiskilled</i>			
Native	216	349	
Foreign Born	324	550	
<i>Unskilled</i>			
Native	231	462	541
Foreign Born	342	553	560
<i>Farm Owner</i>			
Native	203	348	449
Foreign Born	367	537	561
<i>Farm Tenant and Farm Laborer</i>			
Native	190	403	
Foreign Born	327	511	
	RATIOS OF RATES OF FOREIGN BORN TO THOSE OF NATIVE WHITES		
Skilled and Semiskilled	150	158	
Unskilled	148	120	104
Farm Owner	181	154	125
Farm Tenant and Farm Laborer	172	127	

Table 5. Cumulative birth rates of native¹ and foreign-born white² couples of specified occupational class of the husband.

¹ Both husband and wife native white.

² Both husband and wife foreign-born white.

women dying in a five-year period, while these data are for women still living by five-year age groups. Also date of marriage and age of marriage are not available for Madison County women. Thus, the two series can not be compared directly. Nevertheless, the conclusion seems warranted that the age differentials reflect much more than a factor of longevity.

The birth rate in Madison County in 1865 was not far above that for Cattaraugus County a generation or two later. The standardized birth rate for all native families of 315 may be compared with Sydenstricker's rate of 285 for Cattaraugus County in 1900.¹⁴ In the latter county the rate was 269 in 1910 and 298 in 1929. The unstandardized rates for these two coun-

¹⁴ Sydenstricker, Edgar: *op cit.*

Table 6. Percentage age distribution of wives by occupational class of the husband.

OCCUPATIONAL CLASS OF THE HUSBAND	NUMBER	PER CENT	AGE OF WIFE						MEDIAN AGE	MEDIAN VALUE DWELLING
			15-24	25-34	35-44	45-54	55-64	65+		
Professional	148	100.0	14.8	27.7	27.0	16.3	10.1	4.1	36.9	\$1,282
Proprietor	243	99.8	13.1	31.7	30.0	16.8	7.4	0.8	36.2	Over 1,500
Clerical	77	100.1	20.8	39.0	20.8	10.4	6.5	2.6	31.6	1,346
Skilled	581	100.1	11.0	30.3	24.6	19.2	11.4	3.6	37.5	645
Semiskilled	245	99.9	15.5	35.1	21.6	15.5	6.5	5.7	34.3	614
Unskilled	328	100.0	26.8	29.6	16.8	14.0	8.0	4.8	31.9	316
Farm Owner	1,803	100.0	7.3	23.4	25.6	22.7	15.2	5.8	42.0	616
Farm Tenant	645	100.1	25.1	35.7	18.7	10.6	5.9	4.1	30.5	352
Farm Laborer	45	99.9	31.1	31.1	20.0	13.3	2.2	2.2	28.9	275
None	51	99.9	9.8	15.7	11.8	15.7	15.7	31.3	49.1	1,437
Unknown	149	99.9	24.1	26.8	16.8	14.8	10.0	7.4	33.9	545

Both husband and wife native white, husband present.

ties in 1865 were 391 and 333 for native wives. Thus, the birth rate for Madison County was probably below its more western, southern tier neighbor in 1865.

The higher birth rate of the foreign-born women is in part a product of their husbands' occupation and income. The foreign born performed a great many menial tasks, over a third of them being unskilled laborers as against one-twelfth of the native group. (*See* Table 4.)

The number of foreign born is too small to provide many meaningful comparisons, but Table 5 gives the data for those occupational and age classes with at least 20 wives. Foreign-born wives generally had a birth rate fifty per cent higher than native wives whose husbands were in similar occupational categories. There may also be a tendency for these differentials to decrease with advancing age.

OCCUPATION

The predominant impression from the study of occupation in relation to fertility in 1865 is that economic factors were of great importance. (*See* Table 7.) White collar groups had the lowest birth rate, especially over the age of 45, and unskilled workers had the highest birth rate at all ages. Second highest were the farm tenants and farm laborers with two classes, the skilled and semiskilled and the farm owners, coming third with almost identical rates. The median value of the dwelling for these groups, reading from high birth rates to low birth rates, was \$316, \$344, \$637, \$616, and \$1,445.

For this study occupations were coded generally according to the 1940 INDEX OF OCCUPATIONS AND INDUSTRIES of the Bureau of the Census with some few modifications for differing circumstances and functions. Since the area involved in the study was so strongly agrarian, some problems of classification of occupations did not emerge as they might in an urban setting. The final grouping of occupations into five categories was partly the product of necessity in obtaining numbers for analysis and partly the combining of apparently related classes. White collar is composed of professional, proprietor, and clerical occupations

(respectively V, 1, and 2 as the first digit of the occupation code). These compose a rather homogeneous group economically, though the wives of clerical workers were substantially younger. (See Table 6.) The skilled and semiskilled group (coded 3, 4, or 7) were similarly differentiated slightly in the median value of the dwellings and in the age of the wives, but their combination seemed reasonable. Unskilled workers were much younger and lived in cheaper houses. As far as they could be derived, the birth rates of skilled and semiskilled workers seemed to be similar, as against those of the unskilled.

Some skepticism is appropriate about the denotation of farmer and laborer in this census, and some reasons must be advanced for the classifications used. It may be that farmer, laborer, and farm laborer were used indiscriminately by some enumerators, with only one little mark in the proper column (owner of land) separating farm owners and farm renters. Farm laborer was used for only 64 husbands in the sample, 45 of them native, and only five out of twenty-four enumeration districts listed anyone as a farm laborer. Certainly some of the farm tenants are younger sons who will some day own the land, and some may be fathers who have already passed title to their sons. Confirming the family pattern, perhaps, is the fact that wives of farm tenants averaged twelve years younger than farm owners' wives.

Farm tenants and farm laborers are grouped together, however, because they seemed to be more closely related to each other than to any other groups. They are comparable in age and value of dwelling and significantly different from farm owners. (See Table 6.)

Laborer is largely a town occupation as these men are found in large numbers in a few enumeration districts which are primarily non-agricultural.

In most of the recent studies of differential fertility the people in rural occupations have birth rates higher than those in the urban occupations. In the 1865 Madison County sample, however, the skilled and semiskilled workers in the towns and vil-

lages had almost exactly the same birth rate as the farm owners, and the unskilled laborer group was above the farm tenant-farm laborer group. (See Table 7 and Figure 2.) Within the town and rural categories, the occupations followed an inverse relationship with skill and economic condition. One also notes that regardless of residence the occupations are located rather precisely in an apparent economic hierarchy.

There is some possibility that the higher rate of unskilled workers is also related to nativity; these may be (at least in significant proportion) the native children of foreign parents, since there were 656,000 foreign born in a population of slightly over 3,000,000 in New York State in 1850. Yet, in spite of this large number of foreign born in the State as early as 1850, it is

Table 7. Cumulative birth rates of native white families by occupational class of husband and age of wife.

	WHITE COLLAR	OCCUPATIONAL CLASS OF HUSBAND			
		Skilled and Semi- skilled	Unskilled	Farm Owner	Farm Tenant and Farm Laborer
<i>Number of Wives</i>					
Total Under 65	458	790	312	1,691	662
Under 25	70	102	88	132	175
25-34	148	262	97	419	244
35-44	129	196	55	459	130
45-54	73	148	46	407	74
55-64	38	82	26	274	39
<i>Children per 100 Wives</i>					
Total Under 65 (Not Standardized)	242	311	325	348	258
Under 25	86	99	116	92	70
25-34	180	216	231	203	190
35-44	288	349	462	348	403
45-54	364	443	541	449	504
55-64	382	548	708	544	580
Standardized Rate	247	306	375	301	321
Median Age of Wife	35.4	36.1	31.5	40.9	30.9
Per Cent Childless					
45-54	10	9	4	9	8
Median Value of Dwelling	\$1,445	\$637	\$316	\$616	\$344

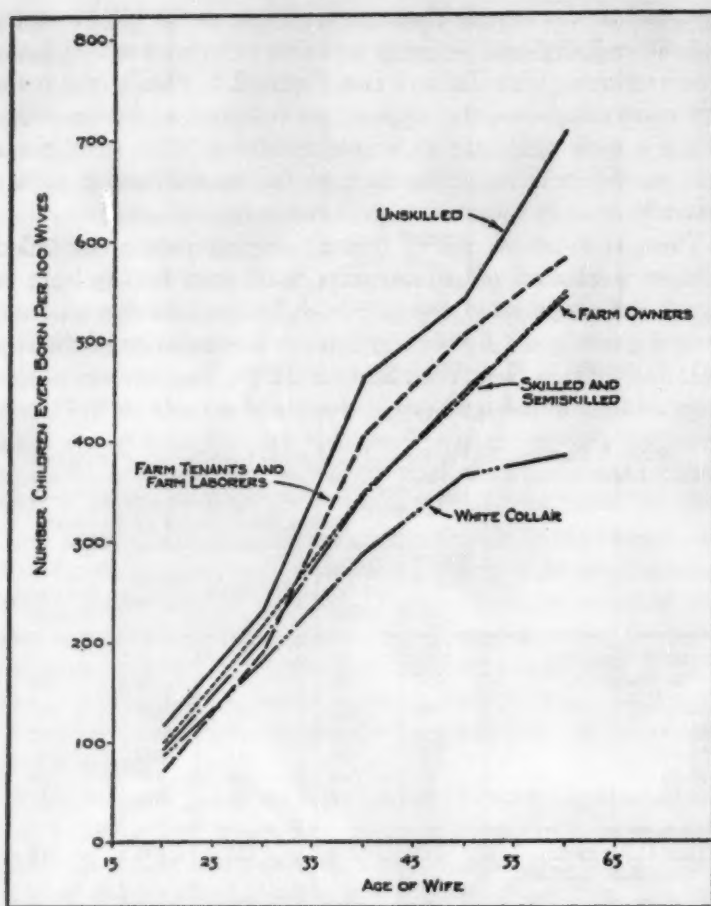


Fig. 2. Cumulative birth rate of married women by husband's occupation and age of wife (both native white).

doubtful if there were very many native women of foreign parentage in the child-bearing ages in 1865. The national record shows, during the decade preceding 1850, 1,415,000 immigrants, but only 409,000 of these came in the first five years; and there were just over 500,000 in the decade of the '30's.¹⁵ Thus the

¹⁵ Thompson, Warren S. and Whelpton, P. K.: *POPULATION TRENDS IN THE UNITED STATES*. New York, McGraw-Hill, 1933, p. 294.

annual rate of immigration was fairly low before 1845, and only from this group could one expect native women of foreign parentage in the child-bearing ages in 1865.

Although the difference between the standardized rates of the unskilled laborers (375) at one extreme and of the white collar group (247) at the other is substantial, it is not unduly large. For example, Sydenstricker and Notestein found cumulative birth rates in 1910 ranging from 129 for professional wives under 45 to 299 for farm laborers' wives.¹⁶ Relatively and absolutely these 1910 differentials are greater than those for 1865.

One other comparison with the 1910 data is fruitful. Wives of "urban" occupational groups in 1865 have rather substantially higher cumulative birth rates at nearly every age up to 45 than comparable occupational groups in 1910, but farmers' wives in the two censuses were very nearly alike, with any possible difference being in the direction of a higher rate for 1910. (See Table 8.) Since the urban data in the study by Sydenstricker and Notestein came from cities of over 100,000 the

Table 8. Comparison of cumulative birth rates in 1865 and 1910 by age of wife and occupational class.

OCCUPATIONAL CLASS	AGE OF THE WIFE AT CENSUS OF 1910 OR 1865					
	15-19	20-24	25-29	30-34	35-39	40-44
White Collar	*	89	148	209	231	345
Professional ¹	35	59	89	133	177	211
Business ¹	37	66	104	147	184	224
Skilled and Semiskilled	*	113	183	251	332	371
Skilled Workers ¹	45	93	137	185	235	277
Unskilled	56	140	172	315	448	479
Unskilled Laborers ¹	59	113	175	229	296	334
Farm Owner	*	98	157	244	328	369
Farm Owners ¹	50	122	188	265	325	376
Farm Tenant & Laborer	29	80	154	251	376	452
Farm Renters ¹	52	113	195	284	367	467
Farm Laborers ¹	59	126	221	320	405	471

* Less than 20 wives.

¹ From Sydenstricker, Edgar and Notestein, Frank W., *Differential Fertility According to Social Class*. *Journal of the American Statistical Association*, xxv, (N. S. No. 169), p. 25.

¹⁶ *Op cit.*, p. 25.

comparison is more interesting than enlightening. If it has any meaning, the comparison demonstrates again that the decline in the birth rate in this part of New York State began very early, and that the farm population did not necessarily lag in this movement.

This discussion of occupational differentials has emphasized most strongly the broad pattern, because safety seemed to lie in numbers. The standardized birth rates show a fairly clear ranking, rather consistently related to assumed economic position as measured by the value of the dwelling. And farmers' birth rates, rather than being higher than those of town residents, are often lower; unskilled laborers' rates are higher than those of farm laborers and farm tenants, and farm owners' rates are very nearly the same as the rates for the skilled and semi-skilled group. The relatively low birth rates of the farm tenant and farm laborer class in the younger ages is worthy of note, however; in the standardized rate they rank second, but they rank fifth and fourth in the two younger age groups where two-thirds of these wives are found.

The numbers of foreign born are so small in this sample that little has been done with them in connection with occupational analysis. Nonetheless, the data in Table 5 are of interest, since they reveal almost no significant occupational differentials.

Table 9. Ratios of birth rates of other occupational classes to unskilled laborers by age of the wife and nativity.

NATIVITY OF COUPLE AND OCCUPATIONAL CLASS OF THE HUSBAND	AGE OF WIFE		
	25-34	35-44	45-54
Both Husband and Wife Native White			
Skilled and Semiskilled	94	76	82
Unskilled	100	100	100
Farm Owner	88	75	83
Farm Tenant and Farm Laborer	82	87	93
Both Husband and Wife Foreign-Born White			
Skilled and Semiskilled	95	99	
Unskilled	100	100	100
Farm Owner	107	97	100
Farm Tenant and Farm Laborer	96	92	

Table 9 provides a comparison of the birth rates for several occupations and age groups by nativity, using data from Table 5 and Table 7. Note that if the birth rate of the unskilled group is 100, then the birth rate of farm owners is 107 at ages 25-34, and 97 and 100 in the next higher age groups. Among native families these ratios are 88, 75, and 83, respectively. Similarly, the differentials for other occupational groups among the foreign born are essentially flat.

VALUE OF THE DWELLING

Evaluations placed by the census enumerators on the dwellings were assumed to be one index of an economic character which could be independent of other measures of social position. Because of its subjective character, this index was used with some diffidence; but experience with it indicates that the interviewers must have used a fair discrimination. Individual homes were valued from \$50 for some log houses to over \$15,000, and the average value of dwellings has been noted as being significantly related to occupation.

In 3,049 households there was only one marital couple per household; an additional 1,045 families were doubled up, 419 of them being considered as the principal family (being listed first in the household) and 626 as secondary families. The difference between the last two categories is due to the fact that occasionally there were two or more secondary families in a household. Then, too, many principal families were not qualified for inclusion in the study due to plural marriages on the part of one spouse, or due to widowhood. Normally widowed parents were not listed first in the household; but when they were they were counted as the principal family.

Crowding was closely related to the size of the family except at the oldest ages. Secondary families were smallest at all ages, and families living alone tended to be slightly larger than either of the "doubled up" types except over the age of 45, where they were slightly smaller than "principal families." (See Table 10.) No economic differential is evident here, except what one would

expect, in that the median value of "only one couple" dwellings is \$586 and of dwellings with two or more families \$785. There is a substantial difference in the ages represented; "principal families" average 44 years for the wife and "secondary families" have a median of 27 years. "Only one couple" families fall in between with a median age of 38 years for the wife.

Cumulative birth rates per hundred mothers are also given in Table 10 because secondary families include a substantial number of childless marriages. Differentials for mothers are reduced somewhat, but they are by no means eliminated.

Analysis of families living alone indicates a weak relationship

Table 10. Cumulative birth rates per 100 wives and per 100 mothers by housing status and by age of wife or mother.

AGE	ONLY ONE COUPLE	MORE THAN ONE COUPLE	
		Principal Family	Secondary Family
Number of Wives	3,049	419	626
CHILDREN EVER BORN PER 100 WIVES			
Total Under 65	331	381	143
15-24	102	100	65
25-34	219	211	134
35-44	364	332	205
45-54	451	458	335
55-64	533	599	460
Median Age	38.2	44.3	27.4
Median Value Dwelling	\$586	\$785	
Per Cent Childless 45-54	9	5	19
Number of Mothers	2,681	383	391
CHILDREN EVER BORN PER 100 MOTHERS			
Total Under 65	377	416	228
15-24	161	156	136
25-34	251	229	203
35-44	385	365	413
45-54	494	484	413
55-64	586	605	493

between the birth rate and the value of the dwelling. (See Table 11 and Figure 3.) When standardized by age the cumulative birth rates range from lowest value of dwelling to highest as follows: 370, 322, 284, 282, and 282; but only at ages 55-64 is the relationship inverse. At other ages there are variations in the rank order of the categories. Especially is there variation in the three categories above \$600, and almost half of the number of families with known valuations fall into these three. The very slight difference in standardized rates for these three categories and the apparently random variations in specific age groups suggests that no significant differentiation can be made here. Value of the dwelling *per se* has slight relation to the birth rate except in so far as only the extremes are considered, and even then the magnitude of the differentials is not great.

Table 11. Differentials in cumulative birth rates by value of dwelling and age of wife.

	VALUE OF DWELLING					
	Under \$300	\$300- 599	\$600- 999	\$1,000- 1,499	\$1,500 & Over	Unknown
<i>Wives</i>						
Total Under 65	668	778	578	399	401	213
Under 25	117	91	60	18	22	22
25-34	222	225	167	111	98	56
35-44	168	228	145	120	113	70
45-54	95	154	126	95	117	40
55-64	66	80	80	55	51	25
<i>Children per 100 Wives</i>						
Total Under 65 (Not Standardized)	354	338	308	327	322	345
Under 25	110	101	93	*	118	96
25-34	254	223	205	198	204	184
35-44	442	385	334	313	325	331
45-54	566	454	383	444	406	578
55-64	588	573	519	495	439	588
Standardized Rate	370	322	284	282	282	318
Median Age of Wife	34.3	37.7	38.8	40.4	41.6	38.6
Per Cent Childless						
45-54	5	12	11	11	5	5

* Under 20 wives.

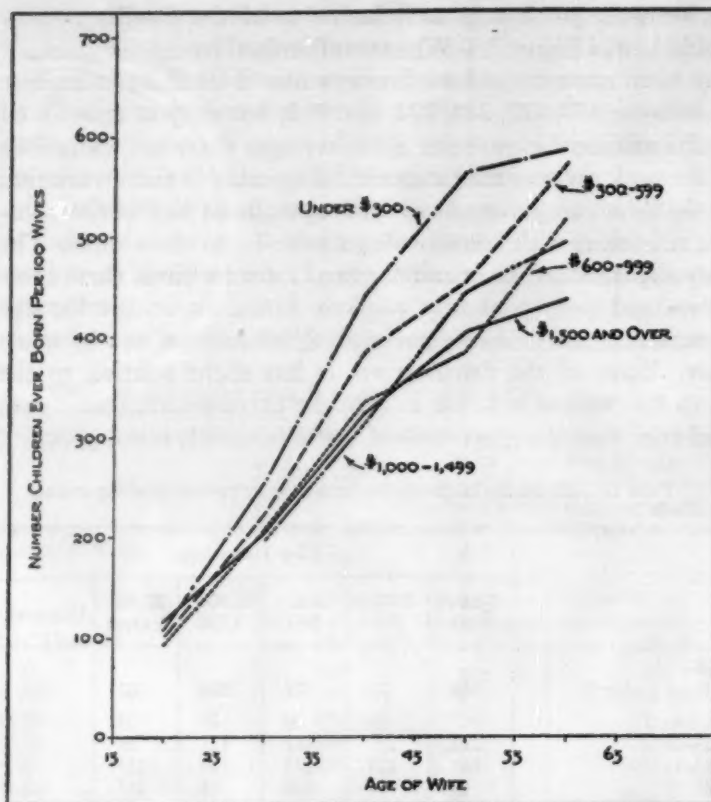


Fig. 3. Cumulative birth rate of married women by value of dwelling and age of wife (both native white, only one married couple in the household).

Slight as the differences are between these economic levels, some of them are related to childlessness, since the proportion of married women who were childless increased on the higher economic levels. An exception to this appeared among those in the \$1,500 and over bracket where the proportion childless was low.

CASH VALUE OF THE FARM

The fact that broad occupational categories often conceal within averages some very substantial internal differences has

often been noted, and an economic analysis within an occupational group sometimes demonstrates a relationship with fertility that is different from the one that is otherwise discernible. For these reasons the farm owners were given particular attention, since the agricultural section of the census provided additional information about each farm. In the coding process the name of each farmer was recorded in order to find his listing in the other section for the cash value of the farm and the value of tools and machinery. Other farm variables were as easily obtained, but these two were selected, the first to obtain an overall indication of general worth, and the second as a presumed index of "modernization." Cash value of the farm ranged from less than \$500 to over \$15,000, and value of tools and machinery from less than \$10 to over \$500. Among 1,797 wives of

Table 12. Cumulative birth rates of farm owners wives by cash value of the farm and age of the wife.

	CASH VALUE OF THE FARM				
	Under \$3,000	\$3,000- 4,999	\$5,000- 6,999	\$7,000 and Over	Unknown
<i>Wives</i>					
Total Under 65	477	411	263	321	219
Under 25	39	34	25	10	24
25-34	115	115	61	62	66
35-44	153	97	67	86	56
45-54	98	100	74	100	35
55-64	72	65	36	63	38
<i>Children per 100 Wives</i>					
Total Under 65 (Not Standardized)	369	297	330	417	321
Under 25	100	88	92	*	96
25-34	220	176	192	232	206
35-44	372	308	313	393	327
45-54	536	387	427	467	383
55-64	521	466	561	608	600
Standardized Rate	328	263	286	328	
Median Age of Wife	40.0	40.3	41.3	44.8	38.0
Per Cent Childless 45-54	7	14	7	7	6

* Under 20 wives.

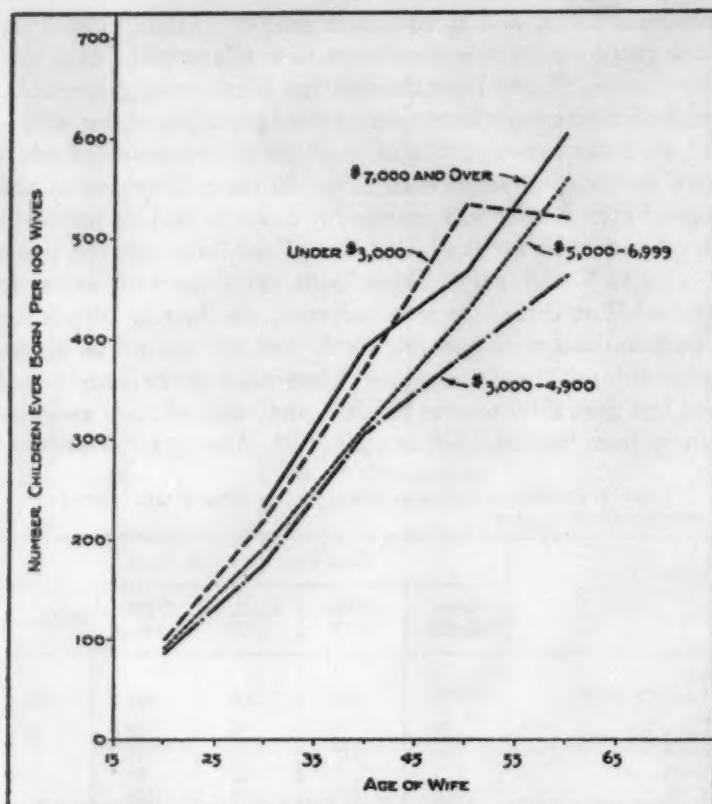


Fig. 4. Cumulative birth rates of farm owners' wives by cash value of farm and age of wife (both native).

farm owners there were 219 for whom data were not obtainable on the value of the farm and 307 on the value of tools and machinery. The remainder were divided into four categories of approximately equal sizes.

These two economic variables were related significantly. Though the mathematical value of the relationship was not calculated, inspection of a scattergram for a substantial proportion of the farm owners showed a positive correlation but with considerable spread.

The cumulative birth rates for wives of farm owners on four different levels of farm value lead to two propositions: (1) differentials between economic levels are quite moderate, and (2) the birth rate is positively related to farm worth except for the poorest group. (See Table 12 and Figure 4.)

At all ages the cumulative birth rates of the three upper economic groups are ranked in positive order, the highest birth rates being found among the most prosperous farmers. The birth rates of the poorest farmers are very similar to the ones for the top group. Standardized birth rates for these groups, reading from the poorest to the prosperous are 328, 263, 286, and 328.

Some progression upward in an economic hierarchy with advancing age was noted in connection with the data on value of the dwelling. This re-appears here with the wives of the most prosperous farmers being about four years older than the others.

Table 13. Cumulative birth rates of farm owners wives by value of tools and machinery and age of wife.

	VALUE OF TOOLS AND MACHINERY				
	Under \$100	\$100-199	\$200-299	\$300 and Over	Unknown
<i>Wives</i>					
Total Under 65	375	464	293	252	307
Under 25	37	36	12	13	34
25-34	93	119	59	56	92
35-44	93	126	89	67	84
45-54	89	115	80	75	48
55-64	63	68	53	41	49
<i>Children per 100 Wives</i>					
Total Under 65	332	331	383	396	322
Under 25	103	69	*	*	94
25-34	215	194	190	211	208
35-44	354	326	336	382	362
45-54	434	437	476	495	394
55-64	465	543	604	576	557
Median Age of Wife	40.7	40.6	43.0	43.0	37.8
Per Cent Childless					
45-54	17	9	5	4	6

* Under 20 wives.

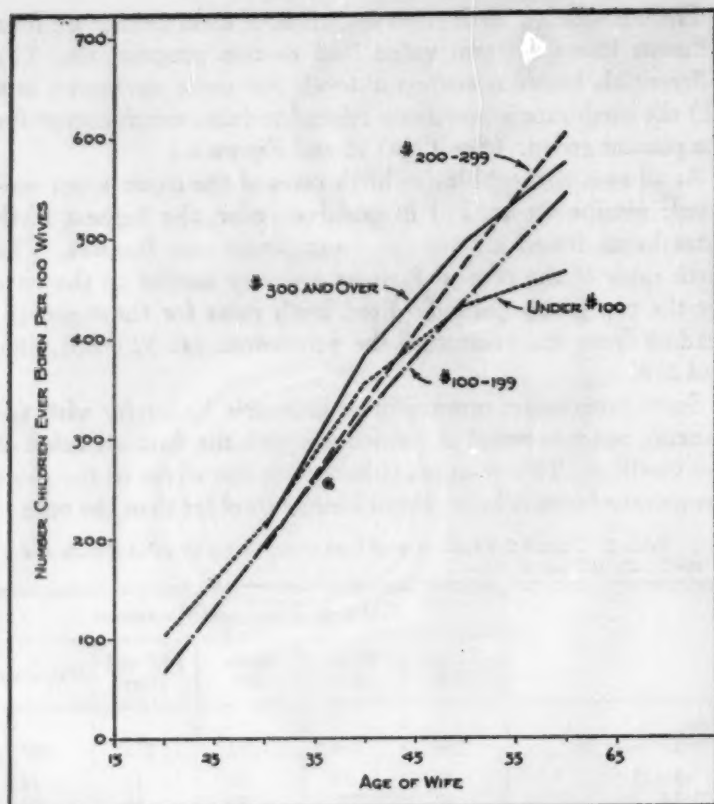


Fig. 5. Cumulative birth rates of farm owners' wives by value of tools and machinery and age of wife (both native white).

VALUE OF TOOLS AND MACHINERY

Differentials in birth rates according to the value of tools and machinery are less pronounced than according to the cash value of the farm. (See Table 13 and Figure 5.) Except at age 55-64 one is likely to conclude that most of the differences observed can be attributed to chance factors—that there are no significant differentials present. It is true that the rank order of the groups is similar with the most prosperous group tending

to have the highest birth rates, but the poorest group here comes out with a middling or low birth rate rather than a high one. And here one particularly interesting fact comes out, namely, that childlessness for those women over the age of 45 tends to decrease in the higher economic positions. Some 17 per cent of the wives over 45 in the poorest economic group had had no children as against 9 per cent, 5 per cent, and 4 per cent for the other groups on a rising scale.

In this section of the study one is reminded of the stereotype of the old fashioned American farm family in which fertility was supposed to be directly related to success; the more sons a family had the better it could live and prosper.

CONCLUSIONS

This study of some four thousand native-white families and an additional thousand foreign-white families in New York State in 1865 can hardly be used to support the "J" hypothesis except insofar as one confines himself to the economic differentials within the farm group. There the top and the bottom groups had higher birth rates than those in between. When one examines nativity, occupation, and value of the dwelling, he finds that the differentials tend to go in the "expected modern" direction, *i. e.*, they are inversely related to economic position.

Relatively, the differences between classes were not large. Possibly this may be due to the fact that the birth rate was already quite low. The standardized birth rate for all native-white couples was 315, which may be compared with a standardized birth rate of 285 in 1900 in Cattaraugus County, and 269 in 1910 and 298 in 1929. The birth rate was also low in some unexpected segments of the County's population. Birth rates were higher for some "town" occupations than for some "rural" occupations. Since Madison County belongs to a group of rural counties which fall in the lowest quartile of the State's counties in 1865 in the birth rate of native-white women, one wonders whether this same phenomenon would be found in a comparable county in the top quartile.

Increasingly higher birth rates for women over forty-five, low birth rates for women native to Madison County, higher birth rates for some town occupations—all these tend to reinforce the conclusion that the decline in the birth rate in Madison County began very early. And it may have begun among farm families as early as among town families.

If these data do not clearly support a "J" hypothesis for Madison County for 1865, neither do they clearly support the earlier analysis of the diffusion of the small family type. Although for the State as a whole there is a negative relationship between urbanization and industrialization and the birth rate, nevertheless, Madison County fails to fit the pattern. This is true in terms of the County's position as a unit, and it is true when one examines the differences within the County in more detail. If the diffusion of the small family pattern began in the cities in some areas of the country, then it may have come very early in the farming areas in Madison County.

"IDEALS" ABOUT FAMILY SIZE IN THE DETROIT METROPOLITAN AREA: 1954

RONALD FREEDMAN, DAVID GOLDBERG, AND HARRY SHARP

IN A country in which most married people make some use of family limitation practices, the values held about "ideal family size" are likely to be important in influencing family growth and population trends. Until we have data on *personal* expectations and desires about family size, information about the more generalized values in this area may be useful in describing the framework within which the personal decisions are made. Since research about family size "norms" or "ideals" is likely to become increasingly important, it may be useful to report the results of asking different kinds of questions in this field.

In a recent article,¹ two of the authors analyzed the information obtained by asking a cross-section sample of Detroit area adults the following question in the spring of 1952:

People have different ideas about children and families. As things are now, what do you think is the ideal number of children for the average American family?

The present paper deals with the comparative results of asking this somewhat different question of a similar sample in the spring of 1954:

In your opinion, what would be the ideal number of children for a young couple to have, if their standard of living is about like yours?

The wording of this question was intended to lead the respondent to use as his point of reference the group with which he identifies his standard of living. But the question is not a personal expectation as such. It may make the respondent think only in terms of the number of children X dollar units can support on the average. There are obviously other factors

¹ Freedman, Ronald and Sharp, Harry: Correlates of Values About Ideal Family Size in the Detroit Metropolitan Area. *Population Studies*, VIII, July, 1954, pp. 35-45.

in family life, at various income levels, that will also affect the desired number of children.

It is possible, however, that the standard of living question does elicit a more personal response than the question used in 1952. In short, this report is in some ways a replication of the 1952 study, but in other respects the present report should and does yield different results.

To summarize the findings: the 1952 and 1954 data lead to comparable conclusions in the following general areas:

1. There is an overwhelming consensus among all major strata of the population that two, three, or four children are "ideal." Families larger than four are considered "ideal" by very few.

2. Catholics in all major socio-economic strata express a significantly higher "ideal" family size than comparable Protestants.

3. Women in the labor force express a lower family size "ideal" than those not in the labor force.

4. In all major strata, ever-married women who are forty years old or over have had *fewer* children on the average than they now consider "ideal."

5. If the mean "ideal" family size were realized in the average Detroit area family, the population would grow considerably without migration, but this would not result in "large" families.

The 1954 data yield important conclusions differing from those of 1952 on the following points:

1. "Ideal" family size is directly rather than inversely related to measures of socio-economic status.

2. "Ideal" family size is not significantly different for persons of southern rural background than for persons from all other backgrounds.

3. Negroes state a much lower "ideal" family size than do whites.

The 1954 data also yield at least one result not covered in the 1952 study. That is, the rather large Catholic-Protestant differences in "ideal" family size depend entirely on the differences in "ideals" between Catholics and Protestants who attend church frequently.

These general findings are documented in more detail in the following discussion.

THE DATA

The data for this report are from interviews taken with a probability sample of the adult population in the tracted area of metropolitan Detroit.² These interviews were taken as part of the annual sample survey of the Detroit Area Study.³

MEAN "IDEAL" FAMILY SIZE

The mean "ideal" number of children of 2.94 for 1954 is somewhat smaller than the 1952 figure of 3.15.⁴ While this overall decrease is comparatively slight, its sources are sufficiently patterned to deserve comment. As Table 1 indicates, the decrease results from a significantly larger proportion of respondents expressing an "ideal" of two or less children and a smaller percentage stating an "ideal" of three or four children in 1954 as compared with 1952. The proportion favoring an "ideal" of more than four is unchanged.

These variations result almost entirely from a decrease in expressed "ideal" among persons in relatively low income, educational, and occupational strata. This is indicated by the data in Table 2. The "ideal" stated by higher strata is fairly stable between 1952 and 1954; the "ideal" of lower strata, however, shows a consistent decrease.

Those persons expressing an "ideal" number of children of less than two appear as a significant group in 1954, although

² The sample was based on a three-stage probability design. Census tracts and blocks were selected with probabilities proportional to size. Approximately three dwelling units were selected in each block. The respondent in each household was selected randomly. In the 1952 study, 749 interviews were taken; in 1954, interviews were obtained from 764 respondents.

³ The Detroit Area Study is associated with the Survey Research Center of the Institute for Social Research of the University of Michigan. The Study has been supported by funds granted to the University by the Ford Foundation for the development of training in the behavioral sciences. For a more complete description of the project, see *A SOCIAL PROFILE OF DETROIT: 1954*. Ann Arbor: The Detroit Area Study, 1954. (Available from the University of Michigan Press); and Freedman, Ronald: *The Detroit Area Study: A Training and Research Laboratory in the Community*. *American Journal of Sociology*, LIX, July, 1953, pp. 30-33.

⁴ This difference is significant at the 5 per cent level. In computing significance tests an allowance was made for the effect of "clustering" in the Detroit Area Study's sample which probably underestimates the significance of differences in some cases.

"IDEAL" NUMBER OF CHILDREN	1952 SAMPLE PER CENT	1954 SAMPLE PER CENT
Less Than Two	2	6
Two	31	35
Three	34	29
Four	26	24
Five	3	2
Six or More	4	4
Total	100	100
Mean "Ideal" Number	3.15	2.94
Number of Cases	683	718

Table 1. Mean "ideal" number of children for the Detroit area as reported in 1952 and 1954.

they were negligible in 1952. They are definitely a lower status group, with a median income of \$3,400 compared with \$5,040 for the total sample; moreover, 18 per cent of this group are white collar workers as compared with 38 per cent in the total population.⁵

While it is possible that these downward shifts in the expressed "ideal" of lower status groups may result from a change in the "times" between 1952 and 1954, we think that it is more likely to be a function of the difference in the questions which were asked.

It should be pointed out that the mean family size expressed as "ideal" by the total sample in both years is above that needed for population replacement, even if allowance is made for the sterile and for those who do not marry. If such an average family size were actually realized, the population would grow fairly rapidly. The fact is that rather small differences in the average number of children may affect population growth substantially, given our low mortality rates. However, an "ideal" of approximately three children certainly does not presage a return to the "large family" pattern.

CONSENSUS ON "IDEAL" FAMILY SIZE

As in 1952, all groups in the 1954 study share a strong con-

⁵ These statements are based on data not shown in this paper.

SOCIAL CHARACTERISTICS	SAMPLE YEAR AND MEAN "IDEAL" NUMBER OF CHILDREN			
	1952		1954	
	Mean "Ideal"	Number of Cases	Mean "Ideal"	Number of Cases
<i>Annual Income of Family Head</i>				
Less than \$3,000	3.21	127	2.59	116
\$3,000-\$3,999	3.17	188	2.64	88
\$4,000-\$4,999	3.00	133	2.92	143
\$5,000-\$6,999	3.01	132	3.17	192
\$7,000 and More	3.19	67	3.15	149
<i>Occupation of Family Head</i>				
Operatives, Service Workers and Laborers	3.11	261	2.64	248
Craftsmen, Foremen and Kindred Workers	3.14	163	2.99	203
Clerical, Sales and Kindred Workers	3.16	83	3.30	80
Professionals, Proprietors, Managers and Officials	3.13	140	3.24	160
<i>Education (Years of School)</i>				
Less Than 7 Years	3.56	80	2.82	92
7-8 Years	3.20	144	2.81	124
9-11 Years	3.05	168	2.82	168
12 Years	3.08	207	3.11	226
More Than 12 Years	3.04	85	3.10	105
<i>Rural-Urban Background</i>				
Only Urban Experience	3.10	471	2.98	506
Some Rural Experience	3.25	204	2.84	212
Southern U. S. Rural	3.56	75	2.88	80
Other Rural	3.08	129	2.83	132
<i>Race</i>				
Negro	3.32	74	2.28	101
White	3.13	609	3.05	617
<i>Age (in Years)</i>				
21-29	3.08	191	2.73	172
30-39	3.11	177	2.94	205
40-49	3.11	148	2.98	138
50-59	3.37	87	3.42	100
60 and Over	3.23	79	2.79	103
<i>Labor Force Status of Women</i>				
Member of Labor Force	3.20	125	2.78	124
Non-Member of Labor Force	3.32	240	3.16	256

Table 2. Mean "ideal" number of children for the Detroit area as reported in 1952 and 1954 by income, occupation, education, rural-urban background, race, age and labor force status of women.

sensus on an "ideal" of two to four children. In no subgroup considered is there less than 79 per cent expressing a preference within that range. There is further evidence of consensus in the relatively small but important differences between the mean "ideal" size of various subgroups. While the *patterns* of differences to be discussed in this paper are significant, the range of these differences is not great. As in the case with the total population, there are no subpopulations expressing a family size "ideal" which could be described as "large" in any historical perspective (none are as large as four, on the average). Yet small as these differences may be among the sub-groups, they are usually large enough to make the difference between population decline and population growth, if "ideals" were realized in actual family size.

GROUP DIFFERENTIALS IN "IDEALS" FOR FAMILY SIZE

Tables 2 and 3 show the variation in mean "ideal" size for specific population sub-groups. The most striking feature of these data is the reversal of customary socio-economic fertility differentials. In general, studies of actual fertility in the modern period have shown an inverse correlation with socio-economic status. The 1952 data on "ideal" size of family also had this pattern. Our present analysis, however, shows a direct correlation between "ideal" family size and such measures of status as income, education and occupation.⁶

Similarly, while we usually expect fertility rates to be higher for persons of rural background than for those of urban background (this was the case in our 1952 data for both "ideal" and actual family size), Table 2 shows that the small difference which exists in the 1954 study is in the direction of a higher "urban" mean.⁷

Table 2 also shows a much lower mean "ideal" size for Negro than for white respondents.⁸ This reverses sharply the 1952

⁶ The extreme categories are significantly different at the .05 level for income and occupation, but not for education.

⁷ Not statistically significant.

⁸ Statistically significant.

SELECTED CONTROLS	RELIGIOUS PREFERENCE AND MEAN "IDEAL" NUMBER OF CHILDREN			
	Catholics		Protestants	
	Mean "Ideal"	Number of Cases	Mean "Ideal"	Number of Cases
TOTAL SAMPLE	3.29	284	2.73	405
<i>Annual Income of Family Head</i>				
Less Than \$4,000	2.92	74	2.48	122
\$4,000-\$5,999	3.44	116	2.75	136
\$6,000 and More	3.39	84	2.96	127
<i>Occupation of Family Head</i>				
Blue Collar Worker	3.11	185	2.59	251
White Collar Worker	3.70	87	3.02	139
<i>Education (Years of School)</i>				
Less Than 9 Years	3.04	93	2.67	112
9-11 Years	3.17	77	2.57	87
12 Years or More	3.58	113	2.83	204
<i>Age (in Years)</i>				
Less Than 40 Years Old	3.26	152	2.57	212
40 Years or Older	3.31	132	2.90	193
<i>Rural-Urban Background</i>				
Only Urban Experience	3.36	219	2.70	264
Some Rural Experience	3.03	65	2.77	141
<i>Church Attendance</i>				
Attends Every Week	3.58	191	2.94	132
Attends Once or Twice Monthly	2.68	41	2.76	107
Attends Rarely or Never	2.69	51	2.55	165
<i>Parochial School Attendance</i>				
Either Parents or Children Attended	3.44	209	—	—
Neither Parents nor Children Attended	2.87	69	—	—

Table 3. Mean "ideal" number of children for the Detroit area as reported in 1954 by religious preference with selected controls.

comparison and is the largest differential found between any major strata analyzed in the 1954 study. Furthermore, 40 per cent of those persons who stated "ideals" of less than two children were Negroes, whereas Negroes comprise only 14 per cent of the Detroit area population.⁹

What is interesting about the whole set of differentials dis-

⁹ These data are not shown in the text.

cussed up to this point is that they are what some observers have expected may develop under conditions of uniform urbanization, universal effective control of family size, and rational action based on family resources.¹⁰ The socio-economic differentials in particular are consistent with the kinds of relationships found for the "number and spacing planned" families in the Indianapolis fertility study.¹¹ It may be that in answering the standard of living question about "ideal" family size, each stratum in the population tends to project what it feels its own group *ought* to do in an urban setting.

The relationship of age to statements about "ideal" family size is the same in the 1952 and 1954 data. There is a gradual increase with age up to age sixty¹² and then a rather abrupt decrease after that point.¹³ One may speculate that this sharp drop is associated with the special problems and frustrations of older people for whom we make no satisfactory family living arrangements in our culture.

The participation of women in the labor force is associated both with a lower "ideal" family size¹⁴ (Table 2) and lower completed family size¹⁵ for ever-married women forty years of age or older (Table 4). The data do not permit us to determine which way the relationship runs: whether those who have fewer children for other reasons are able to enter the labor force, or whether interest in work or the need to work leads to smaller families which are thereafter rationalized as "ideal."

The traditional Catholic-Protestant fertility differentials persist in these 1954 "ideal" family size data as they did in 1952.¹⁶ The differences remain under controls for occupation, income,

¹⁰ For example, see Hawley, Amos: *HUMAN ECOLOGY: A THEORY OF COMMUNITY STRUCTURE*. New York: The Ronald Press, 1950, pp. 114-120; Thompson, Warren: *POPULATION PROBLEMS*. New York: McGraw-Hill Book Company, 1953, p. 194.

¹¹ Kiser, Clyde V.: The Indianapolis Fertility Study—An Example of Planned Observational Research. *Public Opinion Quarterly*, xvii (Winter, 1953-54), pp. 496-510.

¹² Statistically significant.

¹³ *Ibid.*

¹⁴ *Ibid.*

¹⁵ *Ibid.*

¹⁶ *Ibid.*

SOCIAL CHARACTERISTICS	MEAN ACTUAL AND MEAN "IDEAL" NUMBER OF CHILDREN		
	Mean Actual	Mean "Ideal"	Number of Cases
<i>Annual Income of Family Head</i>			
Less Than \$5,000	2.49	3.17	94
\$5,000 and More	2.25	3.40	63
<i>Occupation of Family Head</i>			
Blue Collar Worker	2.76	3.04	93
White Collar Worker	1.97	3.40	67
<i>Education (Years of School)</i>			
Less Than 12 Years	2.85	3.17	110
12 Years or More	1.79	3.26	62
<i>Rural-Urban Background</i>			
Only Urban Experience	2.40	3.28	111
Some Rural Experience	2.56	3.02	62
<i>Labor Force Status</i>			
Member of Labor Force	1.62	3.04	45
Non-Member of Labor Force	2.75	3.23	126
<i>Religious Preference</i>			
Catholic	3.03	3.58	64
Protestant	2.06	2.97	101
TOTAL	2.46	3.19	173

Table 4. Mean actual number of children ever born and mean "ideal" number of children for ever-married Detroit area women forty years of age or older by selected social characteristics.

education, age, and rural-urban background (Table 3).¹⁷

The Catholic-Protestant differential can be attributed to those Catholics whose close tie to the church is indicated by weekly attendance. Catholics who reported attending church infrequently or "never" did not express a significantly different family size "ideal" than did Protestants with similar records of church attendance. The overall higher "ideal" family size for Catholics results from the fact that most persons who express a Catholic preference attend church weekly in Detroit, as they do over the country as a whole.¹⁸ Protestants, on the

¹⁷ While many of the differences are not significant, their direction remains unchanged.

¹⁸ The Catholic Digest Survey: Do Americans Go to Church? *Catholic Digest*, xvii (December, 1952), pp. 1-7.

other hand, are decidedly less likely to attend church frequently than are Catholics.

For Protestants there is a regular decrease in "ideal" family size with decreasing frequency of church attendance. Among Catholics, however, there is no significant difference between those who attend church only once or twice a month and those who never attend. The significantly higher family size "ideal" for Catholics is confined to those who attend church every week. It may also be noted that Catholics who sent their children to parochial school or who had attended themselves also expressed a higher "ideal" than did other Catholics.

In connection with the above, Dudley Kirk has provided evidence that the reduction or elimination of Catholic-Protestant fertility differences expected by demographers is not occurring as yet—even in urban places.¹⁰ Data on actual fertility in the Detroit area for 1954 (Table 4) are consistent with Kirk's estimates of religious differentials for the national population.

Catholic norms about family size as measured by either of our "ideal" family size questions are also consistent with the maintenance of higher Catholic fertility. Moreover, the critical factor in the high Catholic "ideal" appears to be a close tie to the church which is maintained by most Catholics.

There is nothing in our material on religious differentials to indicate the cause-effect direction of the relationship. It may well be that those persons—either Catholic or Protestant—who have more children as a result of non-religious factors are then drawn into the church and its related institutions by their children.

COMPARISONS OF "IDEAL" AND ACTUAL FAMILY SIZE

How does completed family size compare with statements about "ideal" family size? In Table 4, we compare actual and "ideal" family size for ever-married women, forty years of age or older. Perhaps the most significant fact emerging from these 1954 data is the confirmation of the 1952 finding that in every

¹⁰ Kirk, Dudley: Catholic Fertility in the United States. (A paper read at the meeting of the American Sociological Society, Urbana, Illinois, September 8-10, 1954.)

sub-group considered, the "ideal" is higher than the achieved family size. This may indicate that "ideals" need to be discounted to a certain extent in assessing what is likely to happen to future population growth. It is, of course, also possible that these women over forty would have more children if they could "start over." These kinds of questions can best be answered with longitudinal studies in which we collect data on "ideals," intentions, and performance at various stages in the family life cycle.

CONCLUSIONS

In the present paper, we have analyzed the data obtained by asking respondents to state the number of children they would consider "ideal" for families at their own standard of living. The most striking finding is that the answers to this question assume a pattern which is the reverse of that based on historic fertility differentials. In fact, the pattern approaches that which has been predicted for "rational," urban populations. The traditional Catholic-Protestant differentials, however, are maintained under a variety of socio-economic controls. These religious differences in "ideal" family size appear to be a function of closeness in ties to the church, as indicated by church and parochial school attendance.

We recognize that data on "ideals" or "norms" cannot be taken at face value as a basis for predicting fertility. They can only be used as background information which help to set limits on what is probable. Actual family size, however, is not likely to go much beyond the "ideal" in a society in which most families make some use of birth control.

ANNOTATIONS

IMPAIRMENT STUDY—1951¹

THE Society of Actuaries in its first major investigation of mortality and impairment since 1929 has assembled a comprehensive body of data which demonstrates the usually excessive mortality among persons with a medical impairment and its variation by type and severity of impairment. The study is based on the records of over 725,000 insurance policies issued between 1935 and 1949 by 27 large companies in this country and Canada.

The index of mortality used in this report is the "mortality ratio" which expresses the observed number of deaths as a percentage of the expected number. This is given for 79 impairments, many of them subclassified according to severity and duration. The number of expected deaths for each impairment is determined from the combined company experience for a population of the same age and duration of policy composition as the specific impaired population. More detailed tables for each impairment show the mortality ratios by age at issuance of policy and by duration of policy. Tables that may be of special interest to readers in the fields of public health or medicine are those presenting the mortality ratios by major causes of death within each impaired population. Brief discussions of the extent and nature of the data, significant findings, and comparisons with other studies accompany the tables for each impairment.

Some limitations of the data for medical or public health purposes are mentioned in the introduction to the study. These relate primarily to the selection of the population which consists

¹ Society of Actuaries: *IMPAIRMENT STUDY*, 1951. Published by the Society, 1954, 300 pp.

largely of white, adult males of moderate income, and to the accuracy of the diagnoses of the impairments which are based on the medical examination for insurance, a procedure sometimes less thorough than the examination usual in medical practice. In addition, some research workers may be handicapped in the use of this material because tables are not presented for each sex, although the proportion of males and females is given for each impaired population. These limitations, however, should not seriously detract from the value of this volume as a source of much information that is not elsewhere available.

RICHARD V. KASIUŠ

• • •

ACCIDENT FREQUENCY, PLACE OF OCCURRENCE, AND RELATION TO CHRONIC DISEASE¹

THE monograph "Accident Frequency, Place of Occurrence, and Relation to Chronic Disease" is composed of three articles on accidents as recorded in a general morbidity survey.

The first article, Accident Frequency by Specific Cause and by Nature and Site of Injury, was written by Selwyn Collins, Ruth Phillips and Dorothy Oliver. This paper presents data on accidents as reported in the sample population studied in the Eastern Health District of Baltimore where monthly visits were made over a five-year period ending in May, 1943.

As background data for this report, the authors noted trends of accidents of various types. Industrial accident rates show a steady decline since 1906 except for a temporary rise during World War II. Accidental deaths from 13 of the 15 causes available have decreased during the 34 years studied. Deaths from conflagration increased 50 per cent and deaths from automobile accidents increased by 268 per cent.

In the Baltimore study, of the 2,690 injuries (an annual rate of 125 accidents per 1,000 population) 1,110 cases caused dis-

¹ Collins, Selwyn D., Phillips, F. Ruth, and Oliver, Dorothy S.: Accident Frequency, Place of Occurrence, and Relation to Chronic Disease, Public Health Monograph No. 14, Public Health Service Publication, No. 249, 1953, 68 pp.

ability for one or more days and 1,580 accidents caused no loss of time from normal activities.

In terms of total and of disabling cases and excluding miscellaneous accidents, the largest category of the nine other external causes is number of falls. The second highest group, handling or striking objects, is less than one-third as large and motor vehicle accidents follow next in frequency. Three categories, namely, falls, handling or striking an object, and transportation other than motor vehicle, showed a higher frequency among women than men but the reverse was true for the remaining external causes.

In terms of the nature of the injury from all accidents, lacerations and superficial injuries, of equal frequency, are more than twice as frequent as the next lower categories: miscellaneous injuries, and dislocations and sprains. The four groups have similar frequencies in terms of disabling cases. Females had more superficial injuries while among males, lacerations were more frequent.

The data for 1949 for the total United States show that motor vehicle accidents have a higher frequency than falls. In the Eastern Health District study, falls have the highest frequency for both disabling and nondisabling accidents and the rate is higher among females than males.

The highest frequency of all accidents occurs among children. Total and disabling accident rates are higher for males than for females under 35 years but the reverse is true above that age.

Age-sex curves of accident frequency and severity show differences. There were also age variations in the frequency of all injuries of specific nature and anatomical site and of all accidents from specific external causes.

The authors were surprised to learn that 15.7 per cent of all injuries were head or face injuries. A higher proportion of accidents among males results in head injuries than among females. The largest proportion of head injuries occurs among children under 5 years, i.e. 56.8 per cent of all injuries. As age increases, the proportion of injuries that involve the head decreases. These injuries are largely lacerations and superficial injuries.

In relating the external cause of the accident to the nature and site of the resulting injury, it was found that fracture and

joint injury was the highest category in four of the eight external causes of disabling accidents while lacerations were highest in three external causes. The authors noted that the anatomical sites most frequently injured in disabling accidents are also the sites more frequently affected in all accidents. Lower extremities was the most frequent site of injury in five external causes, and hands and fingers were the most frequent sites in three external causes.

In considering the origin of all injuries of a specific nature, falls were either the first or second cause contributing to each of the four classes: fractures and joint injuries, superficial injuries, lacerations, and other injuries.

The second paper, *Risk of Accident at Home, in Public Places and at Work*, was written by Selwyn D. Collins. It is concerned with the place of occurrence of accidents and their external causes for specific age and sex groups.

Rates based upon an intensive home accident study in Michigan and disabling work accident rates based on the United States Bureau of Labor Statistics data for the same five-year period as the Baltimore Study are cited for comparative purposes. The rates in the Baltimore Study are lower than those of the Michigan study where the concentration was solely upon accidents and not total illness data as in Baltimore. The work accident severity rates (based on days lost) in Baltimore are higher than those reported by the Bureau of Labor Statistics.

In the Baltimore Study, comparison of accident rates for 1,000 person-years observed according to place of occurrence (home, public place, or at work) showed home accidents to be the most frequent. For persons aged 15 years or over, home accidents were 27 per cent above and accidents in public places and at work were 8 and 19 per cent, respectively, below the simple average of the three rates. However, when the time exposed to risk of each type of accident is considered and rates per million person-hours are compared, the accident situation is reversed. Home accidents per million person-hours were 41 per cent below the average and accidents in public places and at work were 16 and 25 per cent, respectively, above the average of the three rates.

Using accident rates per million person-hours, the author

presents a detailed analysis of accidents in the three places (home, public place, and at work) according to age, sex, and disability for accidents from specific external causes, and by type of injury.

For the age group 15 years and over, the age-adjusted frequency rate for all accidents for males is highest for work accidents and very low for home accidents; for females, it is highest for accidents in public places, and about one-half as high for accidents at home and at work. Falls in public places account for more than 40 per cent of such accidents to women and 25 per cent to men. Children under 15 years have a high rate of accidents, with falls in public places contributing the highest frequency.

Days of disability per million person-hours show rates consistent with the frequency rates of all accidents: highest for work accidents, next for public places, and lowest for home accidents. Other indices of severity of accidents show this same order of the three groups as to degree of severity.

The third paper, *Relation of Chronic Disease and Socio-Economic Status to Accident Liability*, also is by Selwyn D. Collins. It is concerned with the relation of chronic disease to the occurrence of multiple accidents during a specified period of time.

It is noted that the persons who had repeated accidents during the five-year period had consistently higher percentages in the following disease categories: total chronic illness, major chronic diseases, certain specific chronic diseases and minor chronic diseases, than was true of those who had no accidents. Each sex shows this same relationship of chronic disease to accident frequency.

With respect to socio-economic factors, the data show that accidents for each sex are more frequent in manual occupations than in professional-business-clerical work.

Average annual accident frequency and percentage of persons who had repeated accidents were highest in the lowest income group.

When economic status was determined by the rental or the value of the home, the lower economic group had a higher percentage of persons who had repeated accidents than the upper economic group.

In an attempt to measure accident proneness, a cross-tabulation was made of accident frequency in successive periods of time. The author concludes that there is a correlation between accidents in the first and second biennium. Persons who had a high frequency of accidents in one period tended to have more than the average in a succeeding period of equal length.

MARGUERITE KELLER

• • •

WORLD POPULATION AND PRODUCTION¹

THERE are enough materials on world population to fill a shelf of books and enough on world production to fill a library. The Woytinskys, a husband-wife team, have undertaken to cover both these subjects in a single volume. True, the book is of massive size. In its 1,268 pages are 497 tables and 338 charts and maps. The book weighs over five and one-half pounds.

The structure of the book may be described as follows:

Part One: *Man and His Environment*, begins with a physiographic description of the earth and the remainder of it contains most of the "general demography" that the authors present. There are chapters on the distribution and ethnic characteristics of the earth's population; migration; cities; births, deaths, marriages, and divorces; health; and the future of the world population.

Part Two: *World Needs and Resources*, affords a transition from population to production. In it the authors discuss consumer needs and resources; consumption and standards of living; natural and human resources; abundance and scarcity; and economic patterns.

Part Three: *Agriculture*, contains chapters on agriculture in the world economy; land, farms and farming; food crops; technical crops; livestock and animal products; forests and forest products; and fisheries.

Part Four: *Energy and Mining*, discusses the role of mining

¹ Woytinsky, W. S. and Woytinsky, E. S.: *WORLD POPULATION AND PRODUCTION*. New York, The Twentieth Century Fund, 1953, 1,268 pp. \$12.00.

in the world economy and presents chapters on metallic and nonmetallic minerals; petroleum and natural gas; and the economics of energy and power.

Part Five: *Manufactures*, describes the increasing role of manufactures in the world economy and provides chapters on the following industries: food, drink, and tobacco; textile; iron and steel; machinery and transportation equipment; and chemicals.

For a book of such wide and diverse coverage a final integrating chapter would seem to be in order. Perhaps partly because the book was already so large the volume simply ends with the chapter on the chemical industry. The last sentence of the book is "As the manufacture of chemicals progresses, industry and agriculture throughout the world will become more and more 'chemicalized.'" (p. 1,205.)

There is no doubt that the authors spent many months of grueling labor searching, compiling, recording, and computing simply to secure the basic data for their analysis. The book is a veritable storehouse of information. This and the commendably detailed index probably will give the volume a long life of usefulness as a reference book.

The reviewer will leave to economists the appraisal of the authors' figures and interpretation on various types of production. He was quite impressed, however, by the wide range of the authors' knowledge and interest. He was particularly pleased with their constant concern about the human and cultural as well as the strictly economic and physical factors in production.

The reviewer was rather disappointed with the authors' treatment of population. He realizes that the authors are primarily economists and he has no quarrel with the fact that general demography occupies only about one-fifth of the total book. His disappointment stems rather from what he considers to be superficial treatment of population and the failure to achieve any real integration of population data with the data on production.

When the Woytinskys' book was released the publicity blurbs featured the authors' optimism with regard to the population

growth and food production. Although the reviewer has in the past taken issue with the alarmists and extreme pessimists on this question, he also finds untenable the easy optimism of the Woytinskys. Doubtless most people will acknowledge the possibility of substantial increases in food production; there is disagreement about the limits of these improvements. Much more uncertain, of course, is the trend of world population. The Woytinskys revised the continental projections of population to the year 2,000, prepared by the Office of Population Research in 1945. The data are as follows:

	Estimated Population in the Year 2,000 (Millions)	
	Office of Population Research	Woytinskys
World	3,345	3,250
North America	176	220
Middle and South America	283	280
Europe, Excl. U.S.S.R.	417	440
U.S.S.R.	298	260
Asia, Excl. U.S.S.R.	1,900	1,750
Africa	250	280
Oceania	21	20

The Woytinskys' upward revisions for North America and Europe would seem to be well justified by the course of population trends since 1940. Their downward revision for Asia seems to be based only on their assumption (or hope) that "some of the most overpopulated Asiatic countries will develop a definite population policy long before the end of this century and that its purpose will be to protect population equilibrium rather than to encourage population growth." (p. 259.)

Regarding the lack of integration of materials, the reviewer had the feeling that once the demographic materials were presented in the initial section, they were virtually forgotten. This type of handling hardly seemed to justify the use of the word

population in the title of a book on an equal footing with that of production. As already indicated, however, there are strong features of the book and there is little doubt about its usefulness to people concerned with population and resources.

CLYDE V. KISER

• • •

A THEORY OF ECONOMIC-DEMOGRAPHIC DEVELOPMENT¹

IN the field of demography, the appearance of a book on pure theory is an extraordinary event and it should be welcome. In spite of the recent contributions from Sauvy and others, demography still suffers perhaps more than other social sciences from the lack of a strong backbone of theory. Professor Leibenstein himself has not supplied the missing backbone; the scope of his book is too much restricted for that. But he has given an example of what might be accomplished in developing more comprehensive demographic theories by thoughtful deduction from stated premises with the aid of simple mathematics; and this example may turn out to be his most important contribution.

Much of the work is devoted to the question, how to escape from a state of "Malthusian equilibrium" of population, resources, and income: a condition of stationary, low average income per person, high birth and death rates, and stationary population near the maximum that can be sustained with the available resources. The author begins by defining certain conditions which such an equilibrium must satisfy, and in doing so he contributes a useful clarification of the implicit assumptions underlying Malthusian doctrine. He then proceeds to a mathematical analysis of the effects of certain changes in the demographic and economic variables, seeking to discover in what circumstances a given change can be expected to upset the equilibrium permanently so as to permit a continuing rise

¹ Leibenstein, Harvey: *A THEORY OF ECONOMIC-DEMOGRAPHIC DEVELOPMENT*. Princeton University Press, 1954, 216 pp. \$4.00.

of average income. An interesting result is the "critical minimum effort thesis," to the effect that a change in one of the variables—for example, increase of resources by investment of foreign capital, or diminution of population by emigration—must be of a certain minimum magnitude to make a lasting improvement in the level of living.

The analysis begins with a highly simplified model and complications are introduced one by one in an effort to approximate reality. However, when all the complications have been introduced the model still does not show any close resemblance to existing conditions. For example, it is assumed that in the initial equilibrium the population is at or close to the maximum which can be maintained upon the resources at its command, given the technology, distribution of income, etc. It is doubtful that the population of any important area is now in that position, and it appears unlikely that such a position has been characteristic of the history of population in various parts of the world, at least in recent centuries. Also it is assumed that the trend of income is a major factor, if not absolutely the most important factor, influencing the trend of population or its fluctuations about the equilibrium position. Whatever validity this assumption may have with reference to long-range trends of population in the past, it seems quite unrealistic in the world of today, particularly in the underdeveloped countries where large increases of population are produced by improvements of health conditions having little relation to income.

To repeat, Professor Leibenstein's main contribution may be in illustrating the potential value of his methods of deduction, rather than in the particular theorems which he sets forth. In this connection, not only his treatment of the question mentioned above but also his chapters on "Some elements of a multi-sector model," "On the construction of micro-economic-demographic theories," and on "The relevance, nature, and scope of optimum population theory" are recommended for careful reading. The reader will not find this book easy; he will need plenty of time and at least the normal complement of university courses in mathematics, but if he is patient he should be well rewarded.

JOHN D. DURAND

The first of these is the fact that the United States is a young nation, and that its history is a history of growth and development. It is a history of a people who have been able to overcome many difficulties and to build a great nation out of a small colony. The second fact is that the United States is a nation of immigrants, and that its history is a history of the struggle for the rights of these immigrants. The third fact is that the United States is a nation of free men, and that its history is a history of the struggle for the rights of these free men. The fourth fact is that the United States is a nation of law, and that its history is a history of the struggle for the rights of these laws. The fifth fact is that the United States is a nation of progress, and that its history is a history of the struggle for the rights of these progress. The sixth fact is that the United States is a nation of peace, and that its history is a history of the struggle for the rights of these peace. The seventh fact is that the United States is a nation of justice, and that its history is a history of the struggle for the rights of these justice. The eighth fact is that the United States is a nation of liberty, and that its history is a history of the struggle for the rights of these liberty. The ninth fact is that the United States is a nation of equality, and that its history is a history of the struggle for the rights of these equality. The tenth fact is that the United States is a nation of unity, and that its history is a history of the struggle for the rights of these unity. The eleventh fact is that the United States is a nation of strength, and that its history is a history of the struggle for the rights of these strength. The twelfth fact is that the United States is a nation of wisdom, and that its history is a history of the struggle for the rights of these wisdom. The thirteenth fact is that the United States is a nation of courage, and that its history is a history of the struggle for the rights of these courage. The fourteenth fact is that the United States is a nation of faith, and that its history is a history of the struggle for the rights of these faith. The fifteenth fact is that the United States is a nation of hope, and that its history is a history of the struggle for the rights of these hope. The sixteenth fact is that the United States is a nation of love, and that its history is a history of the struggle for the rights of these love. The seventeenth fact is that the United States is a nation of compassion, and that its history is a history of the struggle for the rights of these compassion. The eighteenth fact is that the United States is a nation of kindness, and that its history is a history of the struggle for the rights of these kindness. The nineteenth fact is that the United States is a nation of gentleness, and that its history is a history of the struggle for the rights of these gentleness. The twentieth fact is that the United States is a nation of meekness, and that its history is a history of the struggle for the rights of these meekness. The twenty-first fact is that the United States is a nation of mildness, and that its history is a history of the struggle for the rights of these mildness. The twenty-second fact is that the United States is a nation of lowliness, and that its history is a history of the struggle for the rights of these lowliness. The twenty-third fact is that the United States is a nation of modesty, and that its history is a history of the struggle for the rights of these modesty. The twenty-fourth fact is that the United States is a nation of humility, and that its history is a history of the struggle for the rights of these humility. The twenty-fifth fact is that the United States is a nation of simplicity, and that its history is a history of the struggle for the rights of these simplicity. The twenty-sixth fact is that the United States is a nation of plainness, and that its history is a history of the struggle for the rights of these plainness. The twenty-seventh fact is that the United States is a nation of unadornedness, and that its history is a history of the struggle for the rights of these unadornedness. The twenty-eighth fact is that the United States is a nation of plainness, and that its history is a history of the struggle for the rights of these plainness. The twenty-ninth fact is that the United States is a nation of unadornedness, and that its history is a history of the struggle for the rights of these unadornedness. The thirtieth fact is that the United States is a nation of plainness, and that its history is a history of the struggle for the rights of these plainness.

